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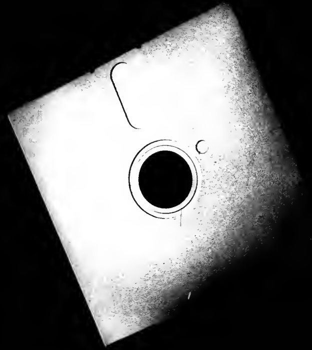

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# VIEWPOINT

### EDITORIAL

## *Select Software Wisely*

The long-awaited increase in programmer productivity has still failed to materialize. Even with information centers and a variety of new productivity tools, the applications backlog in most shops is still three years or more. While programmer productivity may be improving, the number, kind and complexity of new program requests has far outpaced advances.

A new host of tools and methodologies, however, are allowing programmers to make significant advances in speed and cost of software development and in program reliability. But MIS managers should beware of the quick fix or one-size-fits-all syndrome. Each software project has its own special criteria and set of problems as does each organization. What this means for the MIS manager in selecting productivity tools is that there is no one tool for all projects. Shortening software schedules doesn't necessarily mean lowering software costs. No tool or method will work for every situation.

Vendors have been working hard to produce the latest in development workbenches, relational data base management systems, fourth-generation languages, program generators and application generators, for example, but these have done little to stem the backlog buildup.

Equipment purchases in the computer industry have fallen off in the last year. While this can be attributed to a number of things, one major reason lies with the available software. Hardware seems to be advancing at a more rapid pace than the accompanying software leaving MIS and end users with the equipment to work on but few new applications or necessary software to meet their needs. Until management sees evidence that the promised technology will result in real products to meet needs, growth will continue on its present course. In terms of backlog, this means that a number of solutions may be tried, none of which may end up satisfying the end user.

Vendors have too often promised a blue sky to organizations that has resulted in skepticism on the part of users. The frequent overselling of fourth-generation languages, for instance, has led a number of organizations to become distrustful of them and fail to see where these tools can actually be of substantial benefit.

Although we still don't have the ultimate productivity tool at our disposal that does everything, there are some that can do too much. If the wrong tool is selected, the real cost of performance can be high. Longer development times, additional costs of more skilled staff, greater error probability and the possible need for additional development systems to handle other parts of the development task may all become necessary. Remember, a number of helpful tools are available, but choose wisely and well or these productivity tools could only add to your backlog problems.

## Dispelling Myths

**INSIDER**

***Timothy J. Caffrey***

It's tough to keep up. Yesterday's tributes to relational data base technology are now directed at the next wave — distributed data base management systems. Because data base management and administration are the focal points for most applications planning, understanding whether the next wave is a tsunami or a ripple is important. Assuming the mandate of myth buster, some of the most popular attributes of distributed data bases are explored below.

***Everybody's doing it.*** This is an old enticement that is mostly myth. While a lot of people are talking about doing it, few can agree on what "it" really is. According to Bert Collins of Micromentor, Inc., a speaker at a recent industry conference, most companies have some form of low-tech implementation up and running already. Among those that he described was sneakernet, a means of distributing data by carrying a floppy disk from one desktop computer to another.

High-tech implementations are more elusive. The search for working, secure, fully synchronized, multiprocessor-based data base systems is often fruitless. A recent International Data Corp. survey of large-system sites claiming to have distributed data base systems yielded little more than sophisticated, centralized systems.

***There is a product available, but it's still in beta testing and it probably will be for some time.*** "Distributed" has replaced "integrated" as the marketer's favorite product descriptor. Just as distributed processing systems often aren't, distributed data base management systems never are. There are some leaders in the field, however. Software AG of North America, Inc. and Cincom Systems, Inc. are generally acknowledged to be among the leaders in distributed data base system design. For the most part, however, potential buyers are urged to hold on to their checkbooks.

***Having the product solves just half the problem.*** Right on. Micromentor's Collins claims that when the software becomes available, the real problems begin. His concerns are for a data flow run rampant, with individuals able to access and alter more data than could ever be useful.

The real challenge of distributed data base management systems is that they radically challenge the issues of control and ownership of data. When the data base operated in the centralized data center, questions of ownership and control did not come up. In a distributed system, the potential for decentralized or multiple ownership and control demands an entirely new view of data and its role in the organization. This is not an issue that is likely to be resolved when the product arrives.

***The real drive to distributed data bases is hardware-based.*** Probably true. Despite the lesson about the cart and the horse, interest in distributed software is a reaction to the largely unplanned distribution of hardware. The stand-alone processors and application libraries on millions of corporate desktops have set the rules for distributed software implementation. That implementation must acknowledge the diversity of operating systems, transport mechanisms, data structures and access methods that define the systems architecture in many organizations. The implication is that selection of a product is the last step in a distributed data base implementation strategy.

***Laissez-faire will work as effectively with data as with markets.*** An interesting claim. The operating assumption is that once the mechanism for distribution is in place, the need for control for most types of data will be minimized. Responsibility for data integrity would reside with those individuals who decide to use it.

Of course, some data will always require tight control. The challenge is to begin to distribute data and let the market determine its value. Unfortunately, the success or failure of such a proposition is likely to be proven only after someone tries it and reports the results. The potential to make or break both careers and companies is significant. The only certainty about distributed data bases is the degree of uncertainty surrounding possible strategies and directions. The impact on systems architectures, career direction and corporate success will be enormous. And that's no myth.

*Caffrey is vice-president of office automation services for International Data Corp. in Framingham, Mass.*

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**VIEWPOINT**

# Writer Sees Danger In Equating Computer With Human Mind

**Q&A**

***Theodore Roszak***

*Theodore Roszak is a professor of history and the chairman of general studies at California State University in Hayward.*

*Twice nominated for National Book awards, Roszak has written a new book,* The Cult of Information, *a critical examination of the role of computers in business and society. He recently shared some of his insights with* Computerworld Focus *senior writer Stan Kolodziej.*

***You seem to come down pretty hard on the computer industry in your book. While you see the industry making great strides commercially, you believe there has been a lack of awareness of the effects that massive computerization has on the way people think. Would you agree with that?***

Let me make it clear that the book is based on a real appreciation of computer technology, which I consider to be ingenious. I am in no way suggesting that computers should not be a useful part of our society. What I'm concerned with is the tendency of those who are behind the building and disseminating of computers to present these machines as models of the human mind, of equating both the human mind and computer as information processors.

***That concept derives from work in artificial intelligence.***

Yes. AI has been pushing the concept of the model of the human mind as an information processing machine for a long time. With the spread of computers in schools and businesses, that concept is going to become more prevalent.

It's certainly true that the human mind can process information, and it's also true that the computer can do a very good job of imitating and even improving upon that aspect of the mind. The problem, however, comes with the assumption that you can reduce everything else the mind does to information processing, which is what the AI people are committed to achieving. So strong is this assumption that the current problems AI is experiencing in duplicating the human mind are presented only as temporary drawbacks. If more information is put into the machine, if the information is processed faster, if new technologies like parallel processing are brought in, then AI is sure the mind will yield all its secrets.

***One touted leading-edge AI product that is proving popular in the commercial field is the expert system. You made the point in your book, however, that it might not be so leading edge.***

Expert or knowledge-based systems have been around for two or three decades, yet it's the latest thing AI is selling. Again, I want to make clear that I think AI is a valid area of research for the commercial area, and I also think it is invaluable in clarifying how certain parts of the human mind work, but I also think it has major shortcomings.

***Your concerns seem to lie more with computer software than the hardware technology. Where do you think software has fallen short?***

In the way software is perceived. We all recognize that programs are the products of some human minds that decided on some order of priorities, some kind of emphasis on what's important and not important and then generally instructed the machine what to do with all this information. Again, it's the tendency to classify all of this as information in some fashion, suggesting it is still just information processing without some form of interpretation, shaping or assigning of priorities.

You have to do more than process information to understand how a program works, whether it's doing what you wanted it to do and whether it's a good program or not. You have to exercise some critical faculty. Unless this is overcome, software in all fields, including commerce, will always remain what everyone thinks it is, simply an information processing instrument and not a possible extension of the creative side of the mind.

***You must find hope in human nature to overcome many of the problems you've mentioned?***

The one basis of hope you always have is that people are educable, become sufficiently critical and can learn from mistakes. What makes this situation different and somewhat more threatening than anything in the past, however, is that the concept of the mind itself is a main player. I worry that a sufficient number of people may be persuaded that their minds are essentially information processing mechanisms. Once you've altered people's perceptions of what thinking is, then you've also crippled their capacity to be critical of their own experience.

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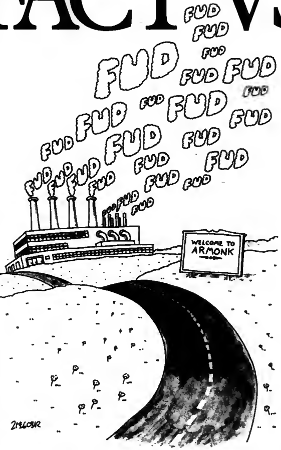

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CIRCLE READER SERVICE NUMBER 236

# Is Your Data Good Enough For Your Future?

**Manager's Corner**

***By Jim Young***

Some interesting fourth-generation software offerings are available today that provide whole new dimensions in usability and versatility. These tools can deliver power plus productivity to an analyst while offering convenience and ease of use to an end user.

You might think that with such revolutionary advantages, everyone would be using this software. Such is not the case. But I think there is an explanation. Fourth-generation language, decision support systems and other information center software are delivery systems that must rest on a foundation of accurate, well-organized, integrated data. Because most organizations do not have this prerequisite, it becomes one of the first obstacles to entering the fourth-generation's promised land.

It is not for lack of data tools because most of these packages work with data base management systems or at least with data manipulation interfaces to files. These tools won't help avoid a major data redefinition and cleanup if the basic data is in typical disarray.

Let's look at the ways you want to evaluate your data to see if it can be plugged into these new high-powered delivery systems.

### Existing data

Existing data must be accurate (95% accuracy is the lowest level I have seen recommended). However, data must also be timely and well defined. Data elements must be used discreetly and consistently; there should be no overlapping meanings or fields that are used with different meanings at different times.

Programs can sort out these complications, users can't. Where relationships are important to the meaning of the data, they must also be clear and direct.

And while features do not impact the quality of the data, there are some that are needed for control. You should check that you know of all synonyms, where and how data is calculated or modified and where it is used.

While there will undoubtedly be the need for data that is not currently automated, there will also be the need to recast data that everyone assumes you already have. Just because a piece of data shows up on a report is no guarantee that it exists in a master file or in any accessible form. Many items of information are arrived at by complex or voluminous algorithms involving many transactions. Purchased applications frequently use this technique because it allows the data to exist in raw form until processed as needed. This approach is often unsuitable for global interactive response and is never desirable to try to replicate. You may want to produce frequently needed data of this type ahead of time.

Another problem is unsimplified data. This either changes during the course of processing, is redefined by reporting programs or is combined to a more simplified level for reporting. If such data is needed by user access software, it should be consolidated, summarized or created in fields of its own along with procedures to keep it accurate, timely and so on. This will help support statistical analysis that may have caused you to look at this advanced software in the first place.

### Duplication of data

One way to deal with data that needs interpretation is to duplicate it. This method may offer the advantages of dedicated availability, special sanitization, simplicity, isolation and security. But at the same time it may offer problems in coordination, integrity and maintenance overhead. It is certainly not as nice as dealing with logical, top-down-designed data.

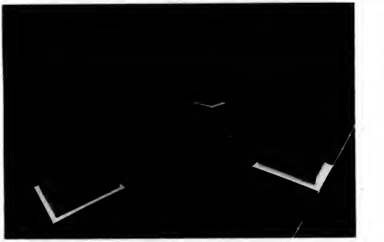
Administrative procedures of this data should also be evaluated and spruced up. For example, any potential remote data updating needs to be integrated carefully. Even for inquiry-only data, the timing of refresh updates or controlling the impact of obsolete data requires judicious evaluations. Security becomes even more of an issue. Access to data must be authorized and then monitored. Additional protective safeguards should be added.

Lastly, users must understand the data at which they are looking. At a minimum, data dictionaries should be available. More focused training and on-line assistance may be necessary to ensure that users are clear on the meaning, idiosyncracies, timeliness and sensitivity of the information.

With attention to the usefulness and management of data, your advanced software products will have something on which to use their power and features, and management can focus on the bigger issue of what data should be delivered. Then and only then will these tools have productive results. Only then will users embrace these software tools, and only then can we get on with the business of using productivity software and enter the fourth generation.

*Young is principal and the director of consulting for Arthur Young & Co., Worcester, Mass. He has worked in the industry for 15 years.*

Before we can share ideas, we have to share information.



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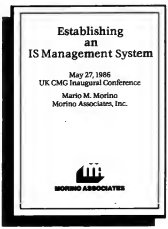

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CIRCLE READER SERVICE NUMBER 245

**VIEWPOINT**

# IBM's Software Strategy: New Tools, New Allies

**Blue Beat**

***Dale Kutnick***

Notwithstanding personal computers and on-line interactive systems supported by relational data base management systems, fourth-generation languages, Cobol restructuring programs and a plethora of other new tools and utilities, the applications backlog in large user shops continues to be three to four years. Programmer productivity is improving, but not fast enough; there's more to do, and applications are becoming more complex.

Meanwhile, personal computer users are still unable to take advantage of the Intel Corp. 80286; most current IBM PC programs offer slight improvements over ones available on the original PC.

On the mainframe side, less than 30% of IBM's MVS customers have migrated to MVS/XA during the past four years because many of the main subsystems (CICS, IMS, TSO) do not take full advantage of the system yet, other than to offer virtual storage relief and faster, more efficient I/O (hardware benefits). Most independent software vendors, especially DBMS suppliers, do not even support MVS/XA's 31-bit mode — they simply run in IBM 370 mode. Users complain the 3090 is not different from the 3080 series machines — that there is no new software to support its advanced architecture. These factors have contributed to the computer industry slump.

### IBM solutions

IBM is addressing the software issue from five directions: more on-line computer power through more powerful workstations and mainframes; a strong emphasis on relational DBMS; end-user tools; programmer application development tools; and soliciting the help of independent software vendors.

The first point is obvious. Relational DBMS (via DB2 and SQL) is now IBM's strategic direction, except in situations requiring high transaction rates. SQL is a proper subset of DB2, supported on the VM and VSE operating systems. It is becoming a de facto query language standard supported by Data General Corp., Cullinet Software, Inc. and others. IBM will likely offer support for SQL on the System/38 by the end of this year. IBM is supporting some of these vendors' efforts even though they are ostensibly competitors.

On the end-user front, IBM has been marketing its Application System product, which runs in both a VM and MVS environment and offers features/functions similar to those found on Information Builders, Inc.'s Focus. In addition, IBM offers The Information Facility and Query Management Facility across operating environment systems to facilitate end-user information extracts. Artificial intelligence tools will be impertant at this level, and third-party offerings will play an important role here.

Programmer productivity tools continue to be a problem for IBM. ADF-II is powerful but too procedural, with limited flexibility and parameters. ISQL is a compromise — not powerful enough for complex applications, yet too procedural for most end users; it is nonetheless good for prototyping and writing simple programs. Cross Systems Product has recently become IBM's strategic development tool across all of its environments. It is interpretive, open and flexible and could be classified as a fourth-generation language, but it still suffers from performance problems and early bugs. It will be at least two years before it could be considered a worthy competitor of Cincom Systems, Inc.'s Mantis.

IBM could use some third-party help in this area and is actively soliciting third-party solutions. Meanwhile, it has released a new generation of languages (Cobol, Fortran and others) to take better advantage of MVS/XA. Fully 75% of mainstream commercial programs are written in old, reliable Cobol. IBM's Cobol Structuring Facility as well as comparable offerings from a few third parties such as Language Technologies and others will help to unravel spaghetti code. Artificial intelligence will have a role to play in this area and in other programmer development tools.

The bottom line is IBM is struggling with its software development tools — both in products it delivers to users and in its own, internal environment. Not only do third-party competitive opportunities abound in this arena, but IBM is working with independent software vendors through seminars, consultations and discounted hardware to combat the software lag.

IBM is acquiring and licensing a great deal of software and jointly marketing applications packages (from Oracle Corp., Hogan Systems, Inc. and others) to support PCs through mainframes. The user is clearly the target of these efforts. Indeed. Competition notwithstanding, IBM has finally realized that only through an open, supportive dialogue with independent software vendors can it hope to address the software logjam and put the information industry back on course.

*Kutnick is executive vice-president of research at the Gartner Group, Inc., headquartered in Stamford, Conn.*

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CIRCLE READER SERVICE NUMBER 238

**VIEWPOINT**

# Assessing The Application Software Resource

## Issues and Answers

*By Robert D. Gilges*

Managing the application software asset is an increasing concern and responsibility of MIS executives. Application systems are expensive to create, even more expensive to maintain and enhance as a business changes and most expensive to replace.

Many corporate software libraries can be valued at tens of millions of dollars. A major Southeast bank, for example, has over 6,000 programs. There are 12 million lines of Cobol software code; at an average cost of $5 per line, the bank's software asset costs $60 million (and there are very few companies that can develop operational software for $5 per line of code).

Until the organization examined the real costs involved in this case, MIS executives had intended to replace all the older applications over the next five years. It became clear, however, that replacement in some areas through new development or even with software packages was not feasible. Alternatives were required. Thus, a new software strategic plan was developed to migrate current systems and target technical and financial objectives.

Most companies manage their software-related activities at corporate expense. Systems development and maintenance make use of people, computer time and related resources and, therefore, appear to be typical corporate expenses. However, these expenses are actually investments in corporate assets.

### Needed: one replacement system

A West Coast utility had a 15-year-old customer billing system in which more than 3,000 documented changes had been made by more than 70 people and for which, over the years, all documentation had fallen by the wayside. With users looking for new features and functions, production runtimes increasing, testing time increasing and response time for changes lengthening, a replacement system was necessary.

Software packages were considered and found wanting. Further, even with nearly 300 new user features, the design of a new customer-developed system looked much like the old one. It was thought that almost all the new features could be accommodated by the old software if this software were revitalized by a reengineering. As a foundation, the current reengineered version uses structured retrofit. And so in seven months, the utility had its desired replacement system, one that performed satisfactorily for the company.

Today there are new software analytical tools that can assess the condition and vulnerabilities that exist in a software asset. The condition of existing application tools can be analyzed and both managerial and technical problem areas can be identified.

This type of analysis helps to define the way strategic investments in corporate software based on current plans and future objectives can be made.

### A Midwest bank's project

A major Midwest bank had a trust system more than 15 years old that needed replacement. There were more than 600 programs, and the users had requested changes that required, among other things, the addition of data fields to system files and the modification of certain reports.

Because a major rewrite seemed the only solution, the project was postponed for several years. The bank determined, using software tools to analyze the applications' use of data and the complexity and architecture of the programs, that the job of engineering was feasible and could be done at a fraction of the alternative replacement cost.

With this in mind, the bank did not discard the existing trust software asset and proceeded to make necessary changes to it that would otherwise have been postponed once more.

Corporate planning is a process of devising strategies to gain competitive advantage. Such objectives often depend upon information systems that report on products, customers, costs, demographics or trends. Indeed, many corporations said they believe the responsiveness of their information systems can be either an advantage or a disadvantage for growth, profits or competitiveness. This leads to the conclusion that the quality and flexibility of these systems is paramount.

Software assessment tools permit the user to address the issue of how to invest strategically in software development, migration and enhancement. In this way, the software asset is continuously reevaluated and repositioned to provide the best current support in terms of corporate objectives.

*Gilges is partner is charge, Information Systems Services Consulting Practice, at Peat, Marwick, Mitchell & Co. in New York. This article was written in conjunction with George A. Kettersbach, managing partner of Peat Marwick's Catalyst Group, which specializes* in *the area of software engineering services.*

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## LETTERS

### Economics Of Education

Jim Young's "astonishment" voiced in the article "Hitting the Books" in the *Computerworld Focus* May 14 issue has another possible explanation: competition. Perhaps the reason hoards of professionals didn't flock to his "wide assortment of quality seminars" is simply a question of supply and demand. If the dozen or so solicitations for "educational opportunities" that I receive every week are any indication, he certainly doesn't have a corner on the market. The accumulated marketing overhead for all those glossies staggers the imagination. They all look "professional" and are accompanied by steep fees and travel expenses. Perhaps information management professionals are becoming inured to these daily doses of "extensive promotion." If my organization were to send a single individual to every seminar invitation we received, we'd be bankrupt in a year. What is needed is a planned approach to integrating education with organization goals. I would appreciate any concrete suggestions Young might have for how we can separate the wheat from the chaff.

William A. Seeley
Senior Systems Programmer
University of Maryland
Baltimore, Md.

■

### Bring Back Memories

I've read so many articles about information centers (and have written a goodly number myself) that I wanted to tell you how much I enjoyed the article "New Life For the Info Center" in the *Computerworld Focus* May 14 issue.

Lee White captured the flavor of an information center through the people with whom she spoke.

The article brought back memories of my own days as an info center manager: No two days were ever the same, and as users grew more sophisticated and began to appreciate what computers could do (knowing just enough to be dangerous, in some cases), my challenges became larger. I was also interested to see that the info center's relationship with MIS is still as complex as ever. That relationship really needs to be managed carefully.

Keep up the good work!

Naomi Karten
President
Karten Associates
Randolph, Mass.

■

### Worth 1,000 Words

I enjoyed reading the article "Getting the Most For Your Dollar" by Mark G. Rawlins in the May 14 *Computerworld Focus*. The article was fun to read and well-written.

One point struck me as very odd, however. The article focused on business graphics and yet there was not a single graph to be found. The author did make excellent use of two charts; perhaps the title should have been "Business Charts."

It seems the author has missed his own points.

If *Computerworld Focus* expects to assist readers in use of business graphics, it certainly would be nice to have an (another?) article that included visual as well as written material on the subject.

Thank you for the opportunity to make a comment. I'm sure I will continue to read your publication in the future.

Ray Mueller
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# Software Trends In The Making

**SOFTWARE UPDATE**

Critics might say the software industry has been stagnant lately, with no big breakthroughs. They're probably right. Under the calm surface, however, enough has been happening that may portend interesting software trends.

This year might be remembered as the breakthrough period for artificial intelligence, the time when AI finally left the laboratories and mainframes and made its first tentative steps into the commercial micro arena.

Companies like Xerox Corp. and Texas Instruments, Inc. have introduced micro. Lisp-based machines, and software developers such as Ashton-Tate and Borland International have entered the market with AI-based software. Philippe Kahn, Borland's outspoken president, produced a mini quake in the industry with the announcement of Turbo Prolog, a bargain-basement-priced ($99.95) "fifth-generation" language development system that Kahn claimed provided comparable performance to prototypes for the Japanese fifth-generation computers. IBM, it is rumored, is not far behind with its own micro-based AI product.

AI software hasn't been standing still in the larger system market either. Teknowledge, Inc. and the Carnegie Group, Inc. have been making breakthroughs in the area of expert systems. Teknowledge has rewritten its S.1 expert system software from a Lisp version to C and made S.1 development software available for minicomputers and workstations for as low as $25,000.

Carnegie Group has integrated Knowledge Craft and Language Craft, both part of the company's AI software development environments, into Version 3.1 of both products. Integrating the two, Carnegie Group officials said, will enable programmers to have greater access to natural language processing when developing expert systems while also giving users some natural language interfaces. Such announcements could give a needed boost to user/programmer relations in AI.

All of this is part of an AI software market that has been growing (see figure this page). Natick, Mass.-based Artificial Intelligence Markets estimates that the market will reach $500 million for expert systems tools, $350 million for AI languages and $200 million for natural language processing by 1990.

■

The Lotus/Intel/Microsoft Expanded Memory Specification has been in the software news for some time, but it might have taken a breakthrough in micro hardware to really get it moving. Intel's introduction of its 80386 processor late last year, has put pressure on software developers to push the processing limits of Intel 8088 and 80286-based machines. These units are experiencing a sales boom because of lowered prices in anticipation of 80386-based machines, the first wave of which should hit the market in late '86 and early '87. Vendors such as Lotus Development Corp., Microsoft Corp. and Ashton-Tate are expected to introduce more powerful versions of their Microsoft MS-DOS-based programs this summer and fall to grab a greater share of this late sales spurt and form a software bridge to the more powerful 80386 machines.

■

The past six months have also seen strategic market reassessments by major software companies such as Lotus, Microsoft and Borland, who are busily involved in alternate technologies such as compact disk read-only memory (CD-ROM) and desktop publishing.

With the economic downturn and a resultant slump in microcomputer hardware and software sales, software companies are looking to expand from a traditionally volatile micro software market into potentially fast growth, future industries such as CD-ROM and desktop publishing. The optical disk storage marketplace has temporarily stalled, however, while it copes with the power plays of a number of companies trying to create de facto optical disk storage standards, but the optical disk industry promises to be a lucrative one for those who jockey into early market positions, especially before IBM makes a decisive move.

■

Lotus, in light of the rather disappointing sales for its Jazz and Symphony products, is trying to shake off the tenacious image of a one-product company. It has purchased data retrieval technology from a company called Infocenter Software and is planning on developing a range of microcomputer-to-mainframe products. Lotus' 1-2-3 might even find a bit of new life in the manufacturing environment, with the help of Laboratory Technologies, which has come out with a product called Labtech Real Time Access, a data acquisition/analysis package that directly plugs real time data into the 1-2-3 spreadsheet.

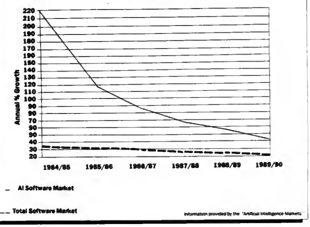
Lotus also finally came around from user pressure and introduced Version 2, its 1-2-3 upgrade, at the same time that it let customers know it would soon no longer support Version 1.1. Many users regarded this as a squeeze play by Lotus to get customers to upgrade quickly to the new release. Aggravating the situation is the feeling that the upgrade is a bit of a performance letdown.

■

Software firms are also beginning to look outside the U.S. for help. Many are betting that the next big market for U.S. software is in Asia, especially Japan, where personal computers are almost as widespread as they are in the U.S. Lotus is one company that has just opened a Tokyo office, planning to distribute a Japanese version of 1-2-3. Why the rush? Though Japanese computers are often faster and cheaper than foreign machines, Japanese business software lags several years behind U.S. products. Experts claim that few

See **UPDATE** page 14

**AI vs. Total Software Market Growth: 1984-1990**



Information provided by the "Artificial Intelligence Markets"

# Downsizing: Big Interest In Economies Of Small

**Downsizing might just be the next catchword in computing. The term is pegged to the growing tendency of MIS departments to place new applications on minis, and even more powerful microcomputer systems, to off-load the escalating burden of mainframe application backlogs and try and improve computer price/performance ratios.**

**Though corporate MIS has exerted more control over user departments in the past few years, economic cutbacks combined with in-house demand for more applications are forcing MIS to place these new applications on smaller machines, relying on users and vendors to supply training and support.**

**"The fact is, there's still a lot of decentralization going on," explained John Manter, client marketing manager at Focus Research, West Hartford, Conn. "End users often want the same sort of application power they had been getting from mainframe-based software. The result is mainframe software vendors migrating their traditional mainframe-based software to minis and micros."**

**Ione Cockrell, vice-president of marketing at SAS Institute, Inc., Cary, N.C., said SAS has seen pressure from clients in the past year to provide microcomputer versions of the company's SAS System, mainframe software for statistical analysis. The company has recently obliged with the PC SAS System.**

**"End users want responsiveness from software, and they want to control it. They want to get at corporate data bases, but they still want to be in business should the mainframe go down. What is surprising us is the large number of sales coming from the user departments and not MIS. Another factor with downsizing is economics. Micro users often don't have to worry about chargebacks from MIS."**

**The trend to downsize seems to be going hand in hand with the economies of small in the computer industry.**

**According to Will Zachmann, vice-president of corporate research at International Data Corp., Framingham, Mass., "Superior price/performance ratios and increased flexibility in microprocessor-based alternatives are making it more and more attractive for users to downsize applications to take advantage of the economies of small. IBM's pricing, the microprocessor revolution, networks and standards in small systems have stood traditional pricing on its head. User organizations will find it increasingly necessary to take advantage of opportunities to downsize, simply to remain competitive."**

**UPDATE** from page 13

good Japanese language programs are available, so U.S. firms have decided it's time to fill the gap.

■

The desktop publishing market, despite some confusion in defining exactly what it is, is experiencing a flood of software companies hurrying to improvise and market software packages on micros, trying to get an early seat on what is perceived to be a desktop publishing gravy train in the next two years. However, users are putting up some resistance to micro publishing packages that are more often than not simply expanded word processing and graphics systems. In the meantime, legitimate low-end publishing systems from Apple Computer, Inc. and Xerox Corp. are selling briskly, early leaders in a market that IBM is now coveting and testing with some publishing software available on its new line of 32-bit, reduced instruction set computing (RISC)-based workstations.

■

IBM has had its share of software moments. Its LU 6.2 peer-to-peer communications protocol might be finally overcoming a wide credibility gap with computer vendors, though many vendors seem to be paying more lip service than producing LU 6.2 products. While everyone agrees LU 6.2 is the way of the future, the industry has locked itself into a "you go first" pattern that has slowed the appearance of LU 6.2-supported software. The rejection of LU 6.2 as a possible integrated Open Systems Interconnet (OSI) standard by the European computer community hasn't helped the LU 6.2 cause. The European rejection gained wide publicity in the West and has made many U.S. software developers think twice about LU 6.2.

IBM has had problems in other areas. Its RISC workstations have been praised for their hardware design, but sales might be slowed by the lack of third-party software products. Though it is IBM, and the technology has been around for several years, RISC is still considered too specialized and risky a proposition for software companies to jump in with products to support it. It doesn't help when IBM maintains its usual stony silence on exactly what its future plans are for RISC in the office.

On the bright side, IBM has been garnering outside support for its SQL relational data base retrieval system, bringing SQL closer to becoming a de facto standard. Most notable recent support has come from Software AG of North America, Inc., who recently introduced AdaSQL, the company's translation link between its Adabas data base management system and IBM's SQL commands.

■

Honeywell, Inc. was stung by the wrath of users recently when it announced it would discontinue its Multics operating system. Though Multics user firms reached a peak of only about 60 by 1983, they proved to be surprisingly loyal to Multics and gadflys to Honeywell, screaming to the press and giving Honeywell the kind of publicity it could do without.

Not to be deterred, Honeywell is busy trying to prove to its customers that it does indeed have a definite direction in the office. Honeywell's proof in the pudding is the Office Network Exchange Architecture (ONEA), an ambitious series of hardware and software networking components linking micros, minis and mainframes in the office with factories and building management systems. A big project, Honeywell hopes ONEA will launch the firm past Digital Equipment Corp., Data General Corp. and others and land the company directly behind IBM to become a major supplier of one-stop office computing.

■

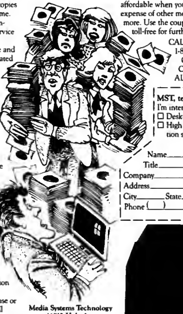
Because fourth-generation languages are still getting the cold shoulder from MIS in the mainframe environment, vendors are trying to push the fourth generation into the micro and low-end mini market with application development tools that can handhold customers all the way through a program's life cycle, from design and prototyping through coding and maintenance. Sales haven't exactly been monumental, however, in a subindustry that is becoming known more for its product hype than its product help. User-friendly systems are proving more difficult than expected for end users, and MIS is finding the productivity claims generated by vendors are often a lot better than those generated in the trenches.

■

And now for Unix. AT&T's long-awaited Unix System V update entered the market just as corporate customers were widening a collective yawn on Unix in the office, and the big push from many Unix software vendors (still relatively few in number) was to integrate Unix with MS-DOS. Unix vendors seem to have come to terms with MS-DOS in the office, though many Unix vendors are hoping the upcoming Intel 80386-based machines will provide the vehicle to finally get users to see the benefits of Unix as a multiuser, micro-based operating system.

In the meantime, Unix vendors have been leaving the office and heading for the fast-growth manufacturing and professional workstation industries where they are finding welcome reception from hardware manufacturers looking to broaden their base of Unix applications.

As for the role of Unix in the office, the corporate perception is not encouraging. According to a recent survey of large corporations by Arthur D. Little Decision Resources, 2% said Unix was critically important, 19% said it was important and 79% said it was not important at all.



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CIRCLE READER SERVICE NUMBER 220

# Forecast '86

The year 1985, also known as the year of the great softness, was not a good year for software vendors overall. Market leaders like Micropro International Corp., Information Science, Inc. and Walker Interactive Products, Inc. were hit hard, and even Management Science America, Inc., a high flyer in previous years, counted only a 7% revenue increase in 1985.

That's not to say there weren't exceptions. Strong performers such as McCormack & Dodge Corp. and Satellite Systems Software International were front-runners but suffered at the hands of sluggish software shipments and longer selling cycles.

Things don't look to improve much for 1986. Karen Kugel, senior research analyst, Software Research Programs, at International Data Corp. (IDC), Framingham, Mass., expected expansion in information spending to be fairly modest this year, about 8% to 10%.

IDC has also predicted 1986 would be a year of heavy price cutting to reach target revenue levels combined with low profits and disappointing sales performances. Over the long haul, however, vendors thought that as new hardware capabilities outdate old software applications and advances in things such as expert systems come into play, growth should maintain a healthy 20% to 30% in the industry-specific software segment.

Vendors offering cross-industry software products, however, were less optimistic. Although cross-industry markets such as accounting; human resource management and payroll; and word processing are expected by IDC to have a compound growth rate of 19% through 1990, the real action is expected to be in the less mature, industry-specific or vertical software market, which could maintain a compound growth rate of 24% or higher through 1990.

Why the difference? Kugel said the decline of cross-industry software revenue can be traced to the maturity of the accounting and human resources management markets, especially in the large-scale systems hardware market.

Growth in the application-specific software market, however, will be driven by vendors that not only provide vertically niched packaged software but that also offer a range of services such as professional consulting and turnkey systems. A new IDC report entitled "Application Solutions Providers: Coping With New Software Needs" explained that vendors of industry-specific solutions tend to view themselves as information processing service providers to the specific industry they serve rather than as package software vendors.

Kugel said one of the hottest application-specific markets is banking. The trend toward deregulation in recent years has had a dramatic affect on banks, increasing their cost of funds and reducing profits. The result is increased competition among banks, thrift institutions and stockbrokers. Banks are looking to computers and, more specifically, to vertical software aimed at the banking industry to stay competitive. A big mover is Hogan Systems, Inc. that has just signed a long-term agreement with IBM. Under terms of the agreement, IBM will sell, service and support Hogan's line of integrated banking software.

# IBM Upgrades, Repositions DB2; Product's Role Poses Threat To Independent DBMS Vendors

IBM's new DB2 release just may have pumped some new life into a flattening U.S. mainframe data base management system market, increasing IBM's market share in the bargain.

IBM has attacked the market with two strategies. The first was a recent upgrading of DB2, replacing the original version introduced in 1983, which was characterized by many users as too slow in comparison with DBMS products from independent software vendors such as Cullinet Software, Inc., Software AG of North America and Applied Data Research, Inc. (ADR). The original DB2 was considered poor competition even against IBM's IMS Full Function, the company's aging hierarchical DBMS.

According to IBM, Release 2 of DB2 boasts performance increases of as much as 25%, depending on workloads and system configuration. IBM claims that using the MVS/XA operating system and an average workload, a user can achieve peak measurements of 5 transaction/sec. on a 4381 Model 2 processor and 45 transaction/sec. on a 3090 Model 200, both substantial increases over Release 1.

IBM's second frontal attack is a repositioning of DB2 in the marketplace, making DB2 useful for a broader range of customer applications — including transaction processing — and not just for low-volume, decision support applications. Bolstering words with action, IBM has instituted a plan under which first-time DB2 users can apply six initial monthly charges to the normal initial license fee, an offer running, however, only until Sept. 30. To help users identify and remove performance bottlenecks and track service levels with DB2, IBM has also added a performance monitor.

Observers said IBM is definitely positioning DB2 as a strategic weapon to be used in the future to manage extremely large, centralized data bases on IBM 370 systems that might act as controllers in distributed processing networks.

The independent software vendors could be in trouble, with analysts pointing out that DB2 might be the first serious challenge to independent DBMS vendors in several years. In IBM's view, it is about time. The computer giant's share of new DBMS installations at U.S. customer sites plummeted to a low of 20% in 1984 compared with about 65% in 1980, according to Focus Research, a West Hartford, Conn., research outfit.

"It's definitely an indication that IBM is going after the independent vendors," declared Robert Ashton, consultant with DB View, Inc., a Boston training firm.

The independents seem to agree. ADR and Computer Corporation of America have implemented their own DBMS rental and leasing programs. In the meantime, Cullinet, the leading independent mainframe software vendor, has seen sales slip for its IDMS/R product and is expected to follow soon with its own rental and leasing plan.

As for IBM's IMS system, the company insists it will continue to support IMS and IMS customers, pointing out recent enhancements to IMS Full Function. Others disagreed. "It seems clear that IBM wants to push DB2 into the IMS performance range and then push IMS aside," said Frank Gens, director of the IBM Systems Advisory Service at International Data Corp., Framingham, Mass.

## U.S. Installed Base of IBM Mainframe-Compatible DBMS: 1985-1987

| Vendor | 1985 | Market Share | Est. 1986 | Market Share | Est. 1987 | Market Share |
|---|---|---|---|---|---|---|
| Computer Corp. of America | 378 | 3.1% | 500 | 3.7% | 625 | 4.3% |
| Software AG of North America, Inc. | 1,000 | 8.3% | 1,125 | 8.4% | 1,225 | 8.4% |
| Cullinet Software, Inc. | 1,500 | 12.4% | 1,750 | 13.1% | 1,975 | 13.6% |
| IBM DB2 | 300 | 2.5% | 750 | 5.6% | 1,200 | 8.3% |
| IBM IMS; DL/1 | 6,100 | 50.5% | 6,100 | 45.8% | 6,000 | 41.4% |
| IBM SQL | 250 | 2.1% | 450 | 3.4% | 600 | 4.1% |
| Cincom Systems, Inc. | 1,000 | 8.3% | 1,100 | 8.3% | 1,250 | 8.6% |
| Applied Data Research, Inc. | 750 | 6.2% | 950 | 7.1% | 1,125 | 7.7% |
| Others | 800 | 6.6% | 600 | 4.5% | 500 | 3.4% |
| TOTALS | 12,075 | 100% | 13,325 | 100% | 14,500 | 100% |

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CIRCLE READER SERVICE NUMBER 225

# The EDI Concept Is Simple; The Problems Are Many

Electronic Data Interchange (EDI) might not be getting much press to date, but some are touting EDI as the next great thrust in corporate computing. When that happens, there will be plenty of press.

EDI as a concept has been around for at least a decade, originating in the transportation industry then spreading to the automotive, drug and chemical industries. Current estimates place 20 to 25 industries using some form of EDI. The concept is simple: Create a standard for exchanging data electronically so companies can do business through computer transactions and do away with traditional paper business procedures. Straight buyer-to-supplier deals. The concept is simple, the problems many.

Saying that no one communications standard exists for industry at large would be an understatement. ANSI X12 has become a de facto standard used in manufacturing, distribution and transportation. The Transportation Data Coordinating Committee sponsors a family of standards used in the transportation, distribution and international communications industries and is promoted as well within the influential General Trade Development Institute in Europe.

Next, there are problems in trying to convince companies that EDI is worth it. Direct benefits include reduced paperwork, fewer errors in order processing, reduced inventory levels, more selling time for sales representatives and greater sales volume from customers. Despite these EDI plusses, many potential user corporations have been pushing the volume of paper transactions and their errors beyond reasonable limits, hesitant to step into what they perceive as a communications standards morass.

### Where are the service companies?

Another stumbling block, however, has been the lack of adequate EDI service companies. To service EDI requires extensive networking facilities and standards know-how, and only now are a number of old-line, third-party network service firms such as McDonnell Douglas EDI Systems Co., General Electric Information Services Co. (Geisco) and Ordernet Services (a subsidiary of Sterling Software, Inc.) moving into position to grab early market positions when EDI is expected to explode.

Their optimism is warranted. The automotive industry has been making great strides in pushing ahead with communications standards such as the Manufacturing Automation Protocol, and the overspill into EDI standards and market is being felt, stimulating action.

ANSI, first of all, has been hurrying to fine-tune X12 standards. New York-based Nynex Material Enterprises recently sponsored a special telecommunications industry forum to create an action group to spur development of standards for computer-to-computer purchase orders and invoices. Attendees included representatives from Northern Telecom, Inc.; GTE Corp.; AT&T; Bell Communications Research Corp.; and various regional telephone holding companies. The group's objectives is to work within standards already established by ANSI.

Beginning Jan. 1, 1987, corporations will be able to initiate automated clearinghouse (ACH) transactions carrying virtually an unlimited amount of accompanying data, under a new payment format approved by the National ACH Association (NACHA). Officials at NACHA said the new Corporate Trade Exchange format is an offshoot of work undertaken earlier in 1986 to reconcile differences between bank-to-bank transaction standards and corporate-to-corporate EDI standards. Again, the new format will accommodate the movement of remittance payment advice in accordance with the ANSI X12 standard.

There has also been some EDI movement in the computer industry. Last year, Control Data Corp. introduced a network transfer service allowing EDI for business partners on different networks. Qantel, Inc. has also introduced Release 6.1 of its QMRP manufacturing software system, which has the ability to link with Q-Auto, its EDI system.

### What's in store for the future?

Though the EDI market is difficult to grasp in way of revenue and growth, estimates project an EDI market of up to $100 million in 1986 from about $20 million to $30 million in 1985. Some researchers see the EDI market mushrooming to about $1.5 billion in 1990, while others see it progressing gradually for the next few years before it picks up speed once standards entanglements are unraveled.

Geisco is one company in a good position to grab a large market share of EDI. Last year the company underwent a dramatic reorganization in response to a stagnant market for its traditional bread-and-butter remote computing services, targeting its services and sales forces for EDI as a fast-growth area. Geisco is specializing in a portfolio of EDI applications for vertical markets such as the transportation and office supply industries.

Explained Geisco's Bob House, manager of EDI product market development, "Once you can show businesses tangible benefits of EDI and not just technical benefits, their resistance decreases. That's happening now."

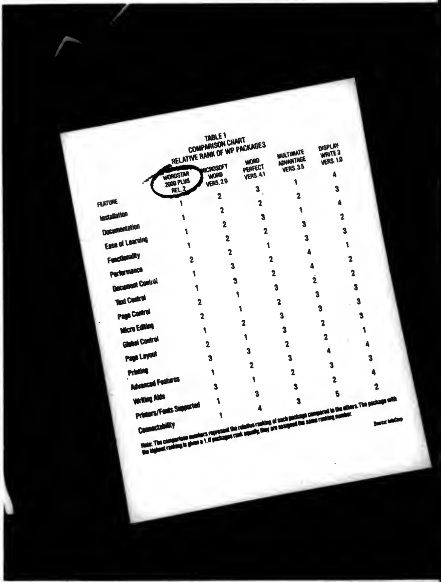

TABLE 1
COMPARISON CHART
RELATIVE RANK OF WP PACKAGES

| FEATURE | WORDSTAR 2000 PLUS REL. 2 | MICROSOFT WORD VERS. 2.0 | WORD PERFECT VERS 4.1 | MULTIMATE ADVANTAGE VERS 3.5 | DISPLAY-WRITE 3 VERS 1.0 |
|---|---|---|---|---|---|
| Installation | 1 | 2 | 3 | 1 | 4 |
| Documentation | 1 | 2 | 2 | 2 | 3 |
| Ease of Learning | 1 | 2 | 3 | 1 | 4 |
| Functionality | 1 | 2 | 2 | 3 | 2 |
| Performance | 2 | 2 | 1 | 3 | 3 |
| Document Control | 1 | 3 | 2 | 4 | 1 |
| Text Control | 1 | 3 | 2 | 4 | 2 |
| Page Control | 2 | 1 | 3 | 2 | 2 |
| Micro Editing | 2 | 1 | 2 | 3 | 3 |
| Global Control | 1 | 2 | 3 | 3 | 3 |
| Page Layout | 2 | 1 | 3 | 2 | 3 |
| Printing | 3 | 3 | 2 | 2 | 1 |
| Advanced Features | 1 | 2 | 3 | 4 | 4 |
| Writing Aids | 3 | 1 | 2 | 3 | 3 |
| Printers/Fonts Supported | 1 | 3 | 3 | 2 | 4 |
| Connectability | 1 | 4 | 3 | 5 | 2 |

Note: The comparison numbers represent the relative ranking of each package compared to the others. The package with the highest ranking is given a 1. If packages rank equally, they are assigned the same ranking number.

Source: InfoCorp

# Software Integration: A Mix-And-Match Business Solution

The last few years software developers have begun integrating their products with vendors' products in order to provide a more complete offering. This integration holds the promise of savings in development and marketing for vendors and of better business solutions for users.

"The one thing many people don't want to do is reinvent the wheel," said Paul Cubbage, senior industry analyst at Dataquest, Inc. Vendors want to concentrate on end-user applications, and software integration provides the means for using other developers' more general products. Examples of such integration strategies can be found at all levels.

At the microcomputer level, computer-aided publishing workstation vendor Texet Corp. resells Syntactics Corp.'s Crystalwriter Plus word processor. The companies worked together to build bridges between Crystalwriter Plus and Texet's publishing software.

At the mini level, Lincoln National Life Insurance sells turnkey office systems based on Prime Computer, Inc. machines. The software combines Marc Software International, Inc.'s Wordmarc word processor and Access Technology, Inc.'s 20/20 spreadsheet with Lincoln National's own OA functions.

At the mainframe level, Issco has linked its Tell-A-Graf and Iviss Manager graphics software with the Megacalc financial spreadsheet from The Mega Group, Inc. The combined package allows users to output graphics representations of their spreadsheets.

### 'Not a new trend'

"This is not a new trend," according to Peter Levine, director of the Gartner Group, Inc.'s software management stategies service. But he noted that the focus has shifted from solving technical problems to solving marketing issues. Instead of building applications around another vendor's software, developers are seeking OEM deals in which they can create an interface between their product and someone else's.

According to Levine, there is more activity because niche product software vendors see that the absence of a solution is an impediment to sales. "If you look at the alliances, you see that these are markets people would not or could not go into," Levine said. "With these alliances, the vendor can deliver a solution even though it's not his product."

For example, McCormick & Dodge Corp. includes Goal Systems International, Inc.'s Phoenix training application with its Millenium mainframe financial software. The user receives both applications on the same tape. "McCormick & Dodge is strong in financial software," said Rick Pinson, vice-president of sales and marketing for Goal Systems. "We're strong in training. Our companies joined to present a product for the market."

Software integration is coming to fruition due to several factors, said Tim Dwyer, vice-president of Marc Software. "Applications like word processing, spreadsheets and communications have each individually matured. Users are used to a nice spreadsheet."

Users have also matured, Dwyer said. "Now that they know how to use a spreadsheet or word processor, they think, 'Wouldn't it be convenient to have them combined?' "

Levine concurred. "Vendors have to create effective packaging. If users have to choose between three products or one, they'll choose one," he said.

The growing ratio for hardware price/performance is also making software integration viable. "To do this seven or eight years ago would have been very expensive," Dwyer said. "The cost for just the CPU was very high." With the computer resources available on superminis and Unix supermicros, Dwyer said he thinks people can put applications together at a reasonable price.

### Interesting combinations

Users can purchase combinations of different developers' software for supermicros, minis and mainframes but not for IBM PC-DOS-based PCs. Dwyer cited two reasons for this. "At the DOS level," he said, "even the PC AT is still weak for having all the functions on a workstation." Dwyer said he believes this limitation will disappear when PCs go to the Intel Corp. 80386 chip.

A second limitation is that some DOS products are written in assembler, making them more difficult to integrate. "DOS packages are single user. They are very machine specific and generally are not meant to be integrated," Dwyer said. However, this is not a limitation for DOS applications written in C, he noted.

At the micro level, the integration of multiple vendors' applications broadens the user's choices, according to Dwyer. "Two years ago, the only integrated applications were products like Lotus' Symphony. The spreadsheet components are nice, but other companies have nicer word processing," he said. "Now there's the integration of full-featured spreadsheets and word processors that have a great depth of functionality."

For larger systems users, integrated software allows users to avoid the programmer costs of tying products together themselves, said John Ulf, director of corporate communications for Issco, and those cost savings are passed on to the customer.

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CIRCLE READER SERVICE NUMBER 221

# 3 USERS. RELATIONAL DBMS. DIFFERENT EXPERIENCES.

BY LEE WHITE

**Edgar F. Codd, the originator of the relational model for data base management, is best known for his 12 rules used to determine whether a data base product is truly relational. His 12 rules are based on Rule Zero: For any system that is advertised as, or claimed to be, a relational data base management system, that system must be able to manage data bases entirely through its relational capabilities.**

**In a recent two-part article written by Codd and appearing in the Oct. 14 and Oct. 28, 1985 issues of *Computerworld*, Codd applied even more stringent rules for relational data base determination.**

**More often than not, however, organizations have their own set of criteria for selecting relational data base systems — regardless of the academic theories. The following is a sampling of how some companies are using relational data bases and what led to their purchasing decision.**

## MOBIL OIL *SOLUTION:* IBM

**Bill Tabachnik, manager of Operations Planning and Technology for Mobil Oil: IBM DB2 is "a true mathematically concocted relational system."**

IBM's contribution to a relational data base discussion would be conspicuous in its absence, but finding a DB2 customer is not necessarily an easy task. Although the relational model for data bases was pioneered in 1972 by E. F. Codd, retired IBM Fellow and Turing Award winner, at the IBM Research Laboratory in San Jose, Calif., many other companies have taken the relational data base ball and run much farther and wider with it than IBM itself.

One respected industry analyst who prefers to remain anonymous lest the God of IBM let loose a thunderbolt from on high said jokingly (we think) that it was his understanding IBM was paying companies to be DB2 installations.

One respected industry analyst who prefers to remain anonymous lest the God of IBM let loose a thunderbolt from on high said jokingly (we think) that it was his understanding IBM was paying com-

panies to be DB2 installations.

Brody continued that among the reasons an organization would choose DB2 over another data base are that the organization believes in using only IBM software, that the organization has faith IBM will evolve DB2 to the appropriate performance levels or that IBM will bring together its data base products, like IMS and DB2, sometime downstream.

"It really depends on what the issues are," Brody said. "If a company has a very conservative posture and strongly prefers IBM software, then it's a good bet. But if you have a company that is very aggressive and wants to put in the hottest high-productivity software there is, then DB2 isn't a good bet."

Perhaps what it really boils down to is the definition of a true relational system. While Brody calls the term relational "a religious issue" upon which it is difficult to comment, Bill Tabachnik, manager of Operations Planning and Technology for Mobil Oil Corp. in New York calls DB2 "a true mathematically concocted relational system."

Mobil installed DB2 two years ago as an early evaluator for IBM. Mobil had been an IMS shop. While Tabachnik called the applications development process within IMS tedious, the productivity improvements were enormous. It was, he explained, a natural consequence to migrate from IMS to a relational data base structure.

Tabachnik said that the true relational nature of DB2 was extremely important to the systems staff at Mobil. "People may ask why we concern ourselves about whether it is in accordance with the definition of truly relational. The importance comes in the actual capabilities of a true relational system. [DB2] will answer every query, assuming the data is there. In the case of all those other pseudorelational systems, there is really just a front end to make it easier for the user to deal with information. Whether it is done in IMS or IDMS, you're not going to get an answer to that query."

Tabachnik regards the DB2 installation as very successful. While the early releases had some shortcomings, he expects Version 2, which they are installing now, to be vastly improved. "We expect to migrate slowly into the use of

See **MOBIL** page 20

# PYA/ MONARCH *SOLUTION:* ADR

**Steve Hansen, PYA/Monarch manager of Data Base Administration: The ADR implementation was smooth and the conversion process from VSAM painless.**

Greenville, S.C.-based PYA/Monarch, Inc., the third-largest institutional food distributor in the country with 1985 revenue of $1.4 billion, was a Burroughs Corp. batch shop in 1981. The company's executives thought it was time to move into the on-line world, and they charged Tom Thomas, current vice-president of management information services who at that time was director of MIS, with the task of coming up with a plan. The result was a decision to become an IBM shop and find software that would allow for the development of common distribution kinds of applications like order processing, inventory control, purchasing and an upgrade of the financial applications.

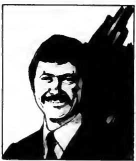
As the move was made from Burroughs to IBM, PYA/Monarch operated in VSAM, and there were problems inherent with VSAM operations in batch and online activities taking place simultaneously. "We knew that our management-level people were interested in the kinds of information summaries that could only be supplied by data base and, from a technical standpoint, we wanted to build all the new applications in a data base environment where we would not be facing the conflicts of batch and on-line working together under VSAM," explained Alex Becker, director of Technical Services and Communications.

The problems at PYA/Monarch were complicated by the nature of the business and the size and geographical location of the 20 divisions in the company. While there was nothing wrong with the VSAM structure itself, PYA/Monarch could not limit itself to doing on-line during the day and batch at night. Rather, it needed the ability to do both simultaneously.

"The technological answer," Becker explained, "was you need something called a data base because a data base, which controls all the access to the files, will handle the arguments between the programs over who is going to get what and when. It also helps that you get certain security and recovery and backup features that you don't have with VSAM. So management asked, 'How much?' We said, 'A couple hundred grand,' and they said, 'Go do it.' We really didn't care whether it was network, heirarchical or relational. Cullinet said they were coming up with some relational stuff, IDMS/R I think they called it, but the [Applied Data Research, Inc. (ADR)] people just happened to already have what we were looking for."

By 1983 the company had hired a data base administrator familiar with Cullinet's IDMS because management knew it was likely that IDMS would be the product chosen. As part of the data base administrator's early functions, he spoke not only with Cullinet's representatives but also with people from ADR about ADR/Datacom/DB and Computer Associates International, Inc. about CA-Universe. Of particular interest was a product that ADR had called VSAM Transparency. "The VSAM Transparency product would allow us to convert to data base quickly without redoing all the programs, and it appeared that ADR's relational product would be

See **PYA** page 20



ILLUSTRATIONS BY ALAN HOPKINS

# LITTON RESOURCES *SOLUTION:* CULLINET

**Wayne Johnson, Litton Resources' DP manager: "We more than justified the cost of the [Cullinet IDMS] system. I think it was very good foresight planning."**

Litton Resources Systems, a division of Litton Industries, Inc., has about 5,000 employees and is involved in oil and gas exploration. Wayne Johnson, manager of the data processing department, was hired in 1982 to help the organization choose and implement a manufacturing system.

Just after Johnson joined Litton, an economic downturn put the project on hold. In 1984 the decision was made to move the project to the front burner once more. With the added expertise of IBM representatives, eight people — including Johnson, some senior vice-presidents and other data processing people — formed a study committee to determine the problems that needed solutions. According to Johnson, the biggest problem was materials movement. "Ours is a worldwide operation, and just being able to move

See **LITTON** page 20

# 3 USERS. RELATIONAL DBMS. DIFFERENT EXPERIENCES.

## MOBIL OIL *SOLUTION:* IBM

**MOBIL** from page 19

DB2 for the high-level transaction processing applications as well as the information center types of applications."

Tabachnik admits there is still much to be done, citing the fact that IBM still has not produced overall dictionary, although the product does have its own directory. But he has high hopes for the future of the product. "The point is it is a mathematically based system, and I think you will see very high-level excellent application generators appended to it. In fact, I think they have recently appended [Application System] and they will also tie [The Information Facility] into it."

Even though DB2 may not be the leader in the data base race, companies like Applied Data Research, Inc. and Cullinet Software, Inc. should look over their shoulders and plan strategies for the future. Gartner Group's Brody said he thinks DB2 has a bright future. "People bring in ADR or IDMS because they have application systems they want to put up now, fast. . . . You bring [DB2] in because you think you're going to be married to it sometime in the future so you might as well live with it ahead of time to find out how it is."

## PYA/ MONARCH *SOLUTION:* ADR

**PYA** from page 19

easier for the development people to learn to use and easier for the data base department to maintain.

Eventually, PYA/Monarch chose ADR/Datacom/DB and with it got their dictionary, the Ideal development language and VSAM Transparency. They had also chosen an IBM 3083 Model J running MVS as hardware. The first conversion efforts were so successful that they went through all the old Burroughs-based batch systems and converted everything to ADR/Datacom/DB.

Although Becker praised the support given PYA/Monarch by ADR staff members, they required little in the way of help from ADR. "Speaking as a manager, the most important thing about the ADR product is that an application development person can learn to use it and not have to understand very much about the product. . . . We haven't had the ADR guy back since 1984," Becker said.

The implementation was smooth and the conversion process relatively painless. In fact, it took only about one year to get fully converted from VSAM to ADR/Datacom/DB. According to Steve Hansen, the data base administrator hired in 1983 who is now manager of Technical Support and Data Base Administration, PYA/Monarch does 85 million data base requests per week and 2.5 million CICS transactions each month. They also process 53,000 batch jobs in a month. "We have 12 branches [of the 20] converted, and as soon as we get a machine upgrade in [the company is upgrading to an IBM 3084 Model Q], we'll probably have the rest of the branches on data base in one weekend," Hansen said.

## LITTON RESOURCES *SOLUTION:* CULLINET

**LITTON** from page 19

materials and supplies to all the different crews that work around the world was a tremendous effort," Johnson said.

While Litton had successfully been conducting business for many years, the biggest question in management's mind was how Litton had been able to manage manually for all that time. The answer was that the company was relying on a few key people who had been with the company for many years and

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had much of the critical business information in their heads.

"We looked at this and said, 'One of these days we're not going to have all these people, and [when that day comes,] there go all of our systems.' We had islands of information. One person would be knowledgeable but everything was in his head, not on paper or in a system. Therefore, he couldn't transfer that information to new people who came on board or quickly communicate to other people throughout the company's functional organization," Johnson explained.

Complicating Litton's decision-making process was a lack of appropriate hardware. The company had multiple IBM and Amdahl Corp. mainframes in its many data centers, some of which were in Houston, but most were handling scientific processing. A few of the larger computers were running business and financial applications, but none of the materials management or manufacturing applications resided on the big machines. The few materials systems they did have were running on System/34 processors, and communications between processors became a big problem.

The hardware choice was made pretty quickly. Because there was never a question as to whose hardware it would be, Litton scoffed up a used 3081 from one of its data centers and upgraded it substantially so that it would handle whatever software the firm chose.

Once the hardware was selected, the study committee came up with some criteria for the software. "Wherever we possibly could, we would buy off-the-shelf, canned software. We also decided that we would not modify the software for the first two years, if at all possible, so we really had to do a detailed review of all the vendors [and] their software," Johnson said.

The committee studied 18 products initially, quickly weeding that number down to five vendors: Comserv Corp., Xerox Corp., Rath and Strong Systems Products, Inc., IBM and Cullinet Software, Inc. While all these vendors' products were strong for the manufacturing resource planning applications, they were not equal on the data base side. Johnson had a particular stake in wanting a product that was also strong on the data base side. "For people like me who have to sustain the products, have to continue to build in the new things, it was important to educate and train the others, to explain what [a data base system] will give in the long term as far as branching out and expanding," he explained.

Eventually, the study team chose Cullinet's IDMS, and there is reportedly not a regret in the bunch. One of the most exciting by-products of IDMS has been the ease with which communciations has been achieved. According to Johnson, prior to IDMS implementation, communications was done primarily via Telex, but now communications is simple, no matter where you might be in the network.

Johnson took some bragging time to talk about the IDMS implementation. "We've been recognized as having the fastest implementation process that ever occurred in any company. We did all the conversion in four and a half months." At the end of 1984, Litton installed the information data base, all the manufacturing application software for purchasing, bill of materials, inventory, shop floor control, order entry, accounts payable, master production schedules and a cost control module. The first plant went into production in March 1985. "We had great cooperation from our data processing people, good interaction between data processing and the user community. They changed the way they did their day-to-day activities and the way the company functioned and worked," Johnson enthused.

Johnson also gave a great deal of credit to the Cullinet support staff, remarking, "I just can't say enough about the relationship and support they came in with."

Litton is now implementation plus one year. And while those of us who are purely energy consumers are thrilled with the low prices at the gas pumps and when we have our home heating oil tanks filled, companies like Litton are feeling the pinch. The technology has helped them weather the economic storm. "We've definitely had to do the job with fewer people, and at the same time, a lot of our key people — our senior people — decided to take retirement. I'm not sure we'd have been able to do that without [IDMS]," according to Johnson.

Johnson also said that when times improve, they will not have to rehire "masses and masses of people. It's a whole different world today, and we have to be much leaner in terms of overhead. We more than justified the cost of the system. I think it was very good foresight planning on our management level here, too. We didn't see a downturn coming, but hindsight tells me it was a good decision," Johnson concluded. ■

*White is a senior writer at* Computerworld Focus.

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## DATA MANAGEMENT

# Untangling Network Software Tie-Ups

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### • BY • MICHAEL A. • GUTTMAN •

The rationale for networking is undergoing a substantial change. Originally, vendors emphasized the value of sharing expensive resources such as hard disks and printers. Now that these items are no longer quite so costly, the latest idea is that network users can share programs and data, even to the extent of replacing minicomputers and mainframes. This idea, of course, implies the existence of a reasonable base of efficient, network-compatible software for managing that shared data.

Such software is only now starting to hit the market. The current offerings fall into three categories. The first category consis[illegible]gle-user PC packages th[illegible] ing upgraded to ru[illegible]rks. The second ca[illegible]uch smaller group[illegible] co[illegible] of software [illegible]rlier for various m[illegible]ms (including minis [illegible] ma[illegible]ks), software [illegible] being ported down to [illegible] The third category, software [illegible]signed and written specifically for networks, is as yet essentially nonexistent; in the long run, however, this category will no doubt become the most important.

> *The latest ide[illegible]hat network users can share program[illegible]ata, even to the extent of replacing m[illegible]puters and mainframes. This idea, of co[illegible], implies the existence of a reason[illegible]e of efficient, network-compatib[illegible]ftware for managing that shared[illegible]uch software is only now [illegible]ing to hit the market.*

It will soon become very difficult f[illegible]ndor to sell into th[illegible]siness market unless he [illegible]s package will at least [illegible]rking environment. Therefore, software vendors are [illegible] in a rush to upgrade their sin[illegible]-user personal computer packages to work on networks. Until recently, this presented a very difficult problem because these vendors were essentially aiming at a moving target — a networking market without standards or stable products. Now, however, the market seems to be at least temporarily shaking out in the general direction of IBM's PC-DOS 3.1 and/or IBM Netbios networking conventions. Although these conventions hardly represent the end-all in networking, most vendors will certainly follow this line of least resistance.

Even with a set of standards, implementing an appropriate scheme of network file and record sharing can be a challenge for a software publisher. Some types of software are relatively easy to modify while others can be very tricky. For example, a word processor, by design, typically involves having each person working on different documents, sometimes at the same time. Normally, the only data sharing involves users referencing the same dictionary or library of templates. Having multiple users reading the same data does not usually cause conflicts as long as provisions can be made to prevent users from editing files currently being edited by others or opening temporary files with the same name at the same time. Therefore, a word processor or spreadsheet should be relatively easy to upgrade for a network.

At the other end of the networking spectrum is a data base application such as accounting. Normally, each accounting user needs to link several files, and the updating of multiple files and records is commonplace. Simply to lock users out of files being updated would drastically limit the number of users who could coexist on the network. Therefore, it is necessary to use complex schemes of locking individual records while allowing other users general read access to files.

Implementing a bulletproof record locking scheme is not easy, especially for the type of on-line, interactive systems that PC users have come to expect and demand. Record updates usually take place in groups, such as adding a transaction and updating a master file, where all the records must be locked before and during the update. And because most data files are indexed to speed up retrieval, the necessary locking procedures may involve several index file records as well. Furthermore, if other users are accessing the updated file, they must somehow be informed of any changes going on or they may get lost searching for deleted records or index pointers.

Some of these problems are less daunting for applications that were developed on minis or mainframes and ported down to PC networks. Many of these applications have already faced the problems of file and record locking long ago and are mature multiuser products. For some applications software, however, a large-computer parentage can be a mixed blessing. This is because real multiuser computers differ from networks in two important areas — performance and control.

The performance issue revolves around the fact that true multiuser computers can handle all requests for shared data directly in memory or via disk direct memory access, and all requests are carefully arbitrated to maximize throughput by the operating system. Networks operate quite differently and much less efficiently from a multiuser point of view. Requests and acknowledgments for transferring shared data must be communicated from PC to server over a relatively slow-speed network, and they must compete and contend with the requests of the other PCs on the network. Add to all this chatter the relatively slow transfer rate of the data itself and an efficient piece of multiuser software can quickly turn into a network hog.

### The control issue

The control issue follows similar lines. An application on a multiuser computer can share a common piece of memory where up-to-date system status information is constantly and instantly available to all users. This might be used, for example, to deal with complex record updating conflicts. No such vehicle exists on a network, so the application software must either constantly pass messages (that must be properly sequenced) or give up some level of coordination and control.

Unfortunately, neither option is very attractive. If full control is preserved through message passing, the amount of network traffic generated could become astronomical and unacceptable from a performance standpoint. However, having to give up or modify the software's method of controlling the various users is a major design change and could significantly affect the feasibility of porting the system to a network at all.

All this might explain why the race to implement network applications software has not been proceeding quite as fast as industry boosters would like. It is becoming increasingly obvious that software already designed with either a single-user or multiuser computer in mind may not lend itself well to a networking port. Of course, this won't stop vendors from offering such products or users from buying them, and the results may be acceptable for certain kinds of applications and environments. There is no doubt, however, that users and vendors alike will soon discover that many of these existing applications will simply not work as required on a network.

### Designing network software

A more rewarding approach may be to design software with networks in mind from the start. Obviously, this involves throwing away a good deal of software that has already been developed and tested and essentially starting from scratch. However, this would certainly not be the first time that the introduction of new computer technology has forced such a move. In any case, the new ubiquity of the PC basically assures that the problems inherent in designing networking software will have to be faced sooner or later.

One relatively simple way to implement an application on a network is to treat all the PCs in the network as simple semiautonomous data entry workstations.

Many applications can be written in such a way that each PC is used primarily as a collector, editor and concentrator of transaction data. Each PC handles its own screen generation and field editing and builds its own local transaction file. At a specified time, such as at the end of a day, a single program is run from a master workstation to update the shared data base with the batch transactions files generated by the individual PCs. The PCs can then begin another batch or be used to generate reports or satisfy inquiries.

There are several advantages to this approach. For starters, access by an individual PC to any of the application's common data such as a customer master file is always strictly read only, so any conflict between workstations is eliminated. Also, each individual PC can be upgraded locally as required to meet a desired level of performance, and new PCs can be added at will with very little affect on network performance and none on network integrity. Furthermore, the application can easily be ported to a mini or mainframe because only the batch updating function requires the services of

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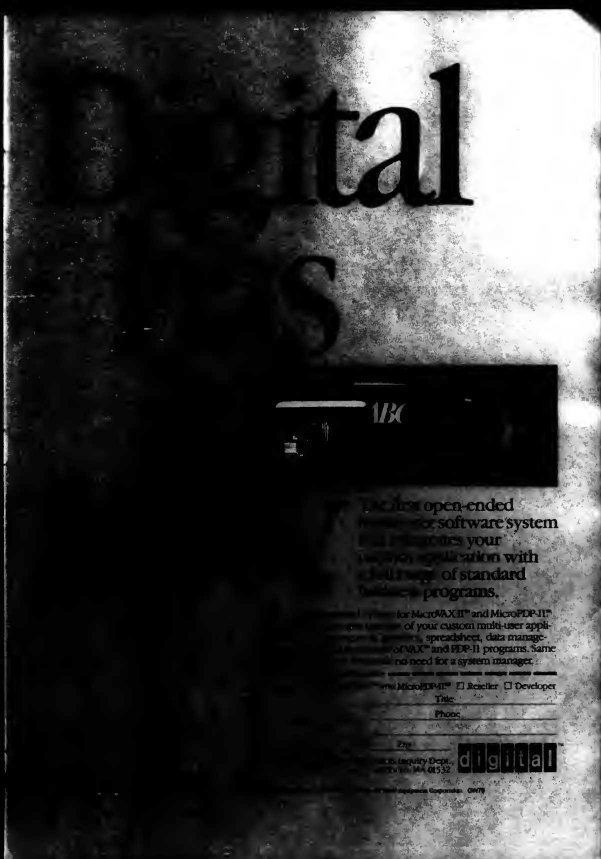

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## DATA MANAGEMENT

> **”**
>
> *Unfortunately, at present, a true distributive processing system for networks is expensive to design and tricky to implement.*

a host machine.

In fact, this type of approach also has the advantage of being very familiar to many data processing departments because it is much like many of the batch and even some of the on-line systems prevalent on mainframes today. Not only will this approach feel comfortable to DP, but it will also allow many functions to be easily off-loaded from busy mainframes without the DP staff losing total control of the data processing function..

Unfortunately, there are still many applications that will not lend themselves well to the simple batch approach. For example, a multistation order entry system typically requires that all transactions be updated in real time. In the past, such applications have required the services of a powerful mini or mainframe. Implementing one of these applications to work properly and efficiently on a network requires a good deal of finesse, and normally it can't be done by simply emulating the functions of a multiuser computer.

A more effective approach to dealing with this problem is distributive processing. One way to visualize distributive processing on a network is to think of all the PCs on the network as a pool of available workers who can flexibly be equipped and assigned, as needed, to the various application tasks at hand. This sort of distributive processing scheme is already in use in many mainframe and minicomputer installations; there is certainly no reason why it cannot and will not be applied to microcomputers as well.

In our order entry example, for instance, several PCs could be assigned to the task of data collection, as with our batch model. However, in this case each data entry PC would be tied to one or more data base PCs that would specialize in the process of managing all common data files in real time. If an entry station required data from a common data base, it would direct a request to the appropriate data base PC, which would handle all the overhead of searching, retrieving and, if necessary, decoding and reformatting. When updating the data base, a data entry PC would merely send the appropriate update information to a data base PC, which would then handle all the necessary record locking, event sequencing, data blocking, encoding and error checking required to complete the update.

This approach not only distributes the processing load among the various PCs but also allows each PC to be optimally configured for its specific task. For example, a data entry PC could be specially equipped for improved data entry graphics or to support functions such as windowing, document scanning or voice recognition. A data base PC, on the other hand, could be equipped with large disk caching memory, high-speed disk drive controllers or fault-tolerant redundancy systems.

Distributive processing also substantially reduces the amount of network traffic required to complete a transaction. For example, if a data entry station required a specific data field from a common data base, it could request and receive just that data from a data base PC. Similarly, specific data items could be updated by transmitting only those items, not the entire transaction from which they are derived. In both cases, the data base PC would handle extraction and/or insertion of the specified data elements into their parent transactions, simultaneously updating any indexes, dictionaries and so on.

Unfortunately, at present, a true distributive processing system is expensive to design and tricky to implement, and precious few tools designed to ease this burden are available. How soon then can we reasonably expect to see such systems come into production?

The power to implement these sophisticated techniques may already be within reach. IBM has already announced its clear intention to support distributive processing both on PCs and on its larger computers. Through the promulgation of its LU 6.2 networking standards, IBM is setting the stage for a variety of computers to communicate as equals on a local-area network. That these standards will be actively supported on its line of PCs has been underscored by the recent and almost simultaneous announcements of both its Token-Ring local-area network and its Advanced Program-to-Program Communications development package for the PC marketplace.

It is still hard to say whether these new developments in networking will be embraced or ignored by the data processing community. It is certainly possible that users will prefer to stay in charted waters for a while, no matter how inviting the horizon may be. However, the proliferation of both PC users and vendors and the continued absence of a standard for multiuser hardware or systems software makes networking, whatever its problems, a likely arena for many new developments in applications software. ◼

*Guttman is an independent consultant based in Marlton, N.J.*

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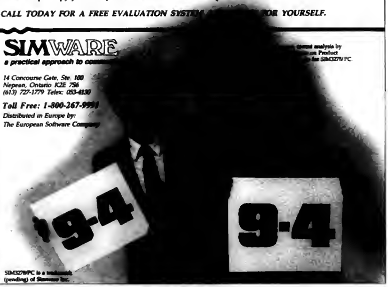

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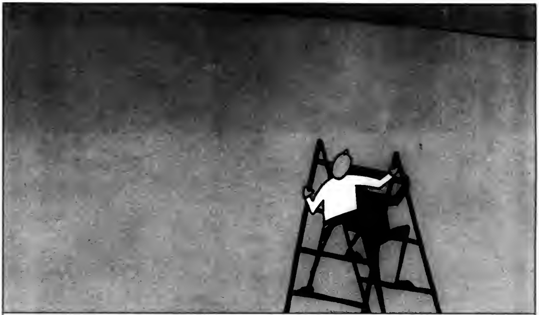

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CIRCLE READER SERVICE NUMBER 205

JOHN OWENS PHOTO

# xecutive nfor

# The Golden

### · BY · DAMIAN · RINALDI ·

Within the walnut-clad corridors of more than a few large organizations, senior executives are sharpening their new strategic weapons. Executive information systems (EIS) are starting to come on-line to assist U.S. management in monitoring the critical success and failure of their own corporate empires.

EIS distill oceans of corporate data, capture relevant external information and present it with a consideration for human factors that gives these products a fighting chance to capture one of the last bastions of low tech in most corporations — the corner office.

But successful implementation of these systems has to include the active and enthusiastic participation of the chief executive officer supported by a coalition of key delegates from MIS and major staff and operational divisions. For an application with such high visibility and potential impact, EIS development often takes on the aura of a Central Intelligence Agency operation because of the sensitivity of the information being captured and presented.

Enough intelligence is leaking out, mostly from vendors, for International Data Corp. to estimate that a market in packaged software sales alone with a potential of more than $750 million by 1995 is opening up to support building EIS. The mainframe-oriented decision support system (DSS) vendors that have traditionally targeted the support staff of the senior executive class are eyeing this new opportunity as a natural extension of their existing business.

EIS vendor strategies are not completely uniform however, with Comshare, Inc. of Ann Arbor, Mich., and newcomer Pilot Executive Software, Inc. of Boston, offering products that are optimized for EIS.

On the other hand, Execucom Systems Corp. of Austin, Texas; Thorn EMI Computer Software, Inc. of Chelmsford, Mass.; and Information Resources, Inc. of Chicago, provide end users with a foundation for building their own EIS by taking advantage of the data base and configurability features of a more traditional solution. The common thread tying the market together is the building-block, tool-kit approach to customized EIS.

In the interest of providing a common standard and avoiding the lack of precision that supports almost every vendor's claims for providing some kind of decision support, it is useful to cut through some of the mythology surrounding the EIS concept. Explaining what EIS are not helps to establish some defensible borders.

■ *EIS are not replacements for personal interaction.*

The vision of a chief executive entombed in a battle-star war room environment watching a dozen monitors and dealing with HAL 9000 is the stuff of science fiction. While such boy-toy concepts may actually inspire support of EIS at some level, that kind of implementation is more likely to reduce executive effectiveness than to enhance it.

The corner office is usually reserved for those individuals who have well-developed people skills. EIS need to be adopted in such a way that senior managers can more effectively use people skills and manage their scarest resource — time — in areas that demand attention.

■ *EIS are not decision support systems.*

EIS are more properly viewed as a subset or branch of decision support. While traditional DSS support analytical applications involving modeling and forecasting, EIS are optimized for tracking and monitoring a wide variety of corporate and external information. Another way of viewing this distinction is that DSS help answer questions including, "What if?" and "What causes?" and EIS pin-

## mation [illegible] ystems

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■ *EIS* [illegible] *the corpor*[illegible]

Corporate [illegible] bases are eno[illegible] storehouses of [illegible] lifeblood of the or[illegible] executives would [illegible] fused and become h[illegible] if they were unfortu[illegible] to stumble into such a [illegible] untutored and unguided. [illegible] of EIS is to distill all the [illegible]

[illegible] the realities of the business they monitor and track. Because that environment changes and because the agenda of the senior staff using an EIS changes, an EIS without built-in flexibility will not deliver much benefit.

■ *EIS are not just for executives.*

Jim Hardwick of RJR Nabisco, Inc. describes the ripple effect: Once an EIS is successfully implemented, anyone who is anyone wants access. Politically, what the chairman is watching is worth watching. This [illegible] terribly [illegible] un- [illegible] the [illegible] of significant [illegible] re- [illegible] for [illegible] use [illegible] for [illegible] all cor- [illegible] empire. A [illegible] smooths the [illegible] data [illegible] systems, [illegible]cluding DSS) [illegible] sources.

[illegible] some differences in [illegible] however. The data base [illegible]nents of the two products optimized for EIS, Comshare's Commander EIS and Pilot's Command Center, both handle numerics and text. Comshare's W/Datman could be characterized as a fourth-generation language applications development tool, while Pilot's EIS Database focuses on time-series data and the import functions that are critical to EIS applications.

■ *EIS are a significant step toward painless end-user computing.*

Local processing on the PC facilitates the support of the advanced human interfaces that make EIS viable. Menus, very simple menus, are used extensively to help guide the EIS user along an [illegible] path toward desired information. Uncluttered screens, keyboardless interfaces and extensive [illegible] handling are all the rule in [illegible] a PC conduit to [illegible] a mainframe.

[illegible] have been widely re[illegible] best ways to [illegible]. [illegible], however, the [illegible]e of [illegible] present [illegible]n has to [illegible] to [illegible]rs for whom [illegible] customized.

An executive committee at RJR Nabisco opted for standard tabular formats they were used to seeing because this was considered more complete than graphical summaries. Metaphor Computer Systems, Inc. of Mountain View, Calif., abandoned the PC interface for their customers in the packaged goods industry in favor of a high-resolution workstation using a mouse, icons and split screens.

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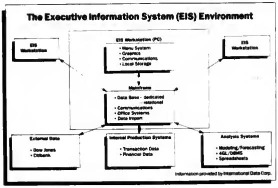

The Executive Information System (EIS) Environment

Information provided by International Data Corp.

■ *EIS are as unique as the businesses they support.*

Hardee's Food Systems, Inc., operating over 2,500 restaurants worldwide, has recovered its investment in Pilot's Command Center within the first year of operation. Savings resulted from more efficient use of labor identified by the EIS. Through seven regional offices, point-of-sale data is collected using Hardee's internally developed nework, Info 2000, fed into a summary report that is then combined in the central, Digital Equipment Corp. VAX-based Pilot data base management system containing historical and competitive data as well as external information from on-line services (Gallup Poll, Dow Jones News Service and Standard & Poor' Register of Corporations). The PCs then run all the user interface software and a comprehensive screen management package that includes menu generation and color graphics programs.

When 15 top executives, including Hardee's chairman, turn on their PCs in the morning, Command Center activates the communications links between the PCs and the corporate VAX. These individuals have automatic access to a custom-built, top-level menu. The menu points the way through a system designed to monitor high-priority pricing promotions and campaigns and critical operational parameters including labor utilization and traffic levels at increasing levels of detail as they navigate through the system.

Dave Roberts, account manager, Strategic Decision Technologies, at Electronic Data Systems Corp. in Flint, Mich., has a team of four EIS specialists supporting 20 operations-level executives managing the vehicle products teams at a large automative manufacturer. Here, a decision support foundation for the EIS operates in an integrated micro-mainframe environment. The EIS component of their implementation of Comshare's Commander EIS tool kit is anchored with the W/Datman data base that is part of the system.

Roberts emphasized that systems integration is critical when viewing EIS in a large, complex environment. Other "DSS" products, including Information Builder, Inc.'s Focus, IBM's DB2 and IMS data bases as well as a host of PC-based solutions have to be integrated into a single, seamless system on a user's desktop. "Pipelines" that Comshare has built and continues to add to the EIS tool kit facilitate the transport of data between incompatible systems.

According to RJR Nabisco's Hardwick, the main corporate budget for his firm has been managed for years with Thorn EMI's FCS DSS. Because of the size of total investment in an entirely new EIS system, RJR Nabisco chose to use FCS's application development capabilities rather than buy another package.

The team implementing the EIS faced its share of challenges. Data gathering at each operating unit involved a unique interface with the systems already in place at corporate headquarters because corporate policy called for maintaining the autonomy of each contributing unit's unique systems environment. Optimizing ease of use required remapping keyboards to avoid confusing executives with keys that had multiple meanings. Success came after careful prototyping of several intermediate stages of the deliverable and through unwavering sponsorship from senior management.

Pressure from other areas of the company to make the EIS more widely available has also put the company's steering committee in a difficult position. It is beginning to try to balance the benefits of a valuable management tool against the status access of high-level strategic intelligence data without compromising the sensitive nature of the information.

As we have seen, the discussions on EIS have moved well beyond the question of whether executives are really afraid of keyboards to more substantive issues. Response time leads the check-off list for EIS implementation, with most executives requiring instant feedback. The data base configurations underlying these systems focus on data

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## Issue: August 20 - Closing: July 11

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access in homage to the response time issue. EIS designers have blown away the current definition of ease of use, and in the words of David Friend, Pilot's chairman, "Less is definitely more."

The learning curve for EIS should peak within minutes, and if the system isn't intuitive and built around the lowest common denominator of computing experience, it is doomed to fail.

Those systems that are actually in place have been implemented with the full support of the executives they are designed to serve, particularly CEOs. As with any rigorous specification, users have to be involved in the process of defining the information they need. Their involvement, enthusiastic support and clout are invaluable when it actually comes time to tap into the organizational fiefdoms where the real information lies.

Look for implementation of EIS to bring the issue of organizationwide data administration to the forefront. Data dictionary and seamless interchange will have to be far more prevalent than they are today. Today's support structure needs further fleshing out before the promise of EIS will be realized.

In their search for any advantage, the corporate shoguns are arming their own elite with the new swords of executive information systems. Born out of a need highlighted by constant reminders that information is an asset to be managed and used tactically and strategically, EIS are just beginning to take on a larger and more important role in the corporate wars for bigger profits and higher growth. F

*Rinaldi is director, Software Research, for International Data Corp. (IDC) in Framingham, Mass. Jastrzembski is a senior consultant for IDC.*

## EIS Topic Steals Show

**At last year's DSS '85 conference, show organizers weren't asking the classic decision support system (DSS) question, "What if?" Instead, they were wondering, "Should we even have a DSS '86?" The vendors, users and academics who support this conference that examines DSS technology, issues and research on DSS are bored talking about an area that has changed very little over the past four years. Peter Keen, a noted DSS guru, wryly referred to the unappealing prospects of reviewing one more paper comparing the decision-making performance of a group equipped with state-of-the-art graphics workstations with a control group suspended upside down from a trapeze.**

**DSS '86, held in Arlington, Va., in May, was a welcome and refreshing change for most attendees. The conference was administered for the first time by the influential 6,500-member Institute for Management Science. It would not be an exaggeration to say that the presentations and vendors focusing on executive information systems (EIS) stole the show.**

**The majority of more than 200 attendees flocked to a series of EIS presentations organized by Pilot Executive Software, Inc.'s David Friend at the expense of the more traditional DSS tracks. Other hot conference topics included artifical intelligence, particularly expert systems implementations of traditional DSS applications.**

**In his closing address, Keen extolled DSS futurists to consider "semi-expert" systems that would provide managers with more guidance than current approaches without locking them into a prescribed solution. Keen and others challenged attendees to apply more energy to the "decision" part of decision support systems by unearthing the decisions that really matter in organizations. Ralph Sprague of the University of Hawaii highlighted the trend toward building better organisational support for DSS and EIS applications and suggested getting away from the Rambo-style, quick-hit applications that characterise traditional DSS efforts.**

**The decision to welcome EIS and AI proponents to rejuvenate the worn-out DSS concept was a refreshing example of the message matching the medium.**

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CIRCLE READER SERVICE NUMBER 191

## LONG-RANGE PLANNING

# Tough Hardware Choices For Winning Software

### ·BY·LOUIS·MAZZUCCHELLI· ·&·READ·FLEMING·

How many times have you heard the claim: "This new software tool will make programmers obsolete?" or, "This one integrated product will totally eliminate your applications backlog?" Probably too many times. These and similar claims have been made for a wide range of products, from data base query languages to Cobol applications generators. Now, as the technologies of computer-aided software engineering (CASE) begin to enter the marketplace, we are beginning to hear lots of these same claims.

CASE attempts to do for software analysts, designers and programmers (whom we refer to as "software engineers") what computer-aided design (CAD) and computer-aided engineering (CAE) have done for mechanical, industrial, electrical and other "hardware engineers." CASE tools are designed to improve the software engineer's productivity by providing an efficient environment for the creation, storage, manipulation and dissemination of the software engineering products.

TOM BARRETT

While many such tools are presented as robust and stable solutions to some or all software engineering problems, the fact is the technologies are young, and many of the tools based on them have not matured to the point where they can handle real-world (large, complex, constantly changing, long-term) projects.

Think about where your own software development organization will be in future — what projects and problems might exist and what kind of environment would exist to deal with them. If you look ahead even only a few years, you'll probably find there is a growing diversity of problems, a growing complexity of problems and a changing technology base. To deal with the issue of diversity, be prepared to acquire multiple tools that are aimed at specific problems but can work together. To face the issue of growing complexity, look for tools that can scale up to the size of your problems. And to deal with changing technologies, look for tools that anticipate where technology will be, not ones that dwell on where it has been.

Software products of any kind, including CASE tools, can only be as good as their supporting system architectures. This means a buyer must consider issues including the host hardware, operating systems and, in light of future needs, the potential for growth. An investment in development tools is generally a long-term investment including not just the tools themselves but the training, the base of experience gained by the organization and the data

## LONG-RANGE PLANNING

generated in the use of the tools. Choosing a tool without understanding the capabilities of the host and how they relate to the future as well as present needs of a software development organization can lead to disappointment or, at worst, disaster.

Many of the software engineering tools available today are designed to run on today's personal computers, usually the IBM Personal Computer family and compatibles. How do the architectural capabilities of these machines affect their ability to support software engineering tools? And what is the future of these machines?

The basic components of any computer are a processor, memory, mass storage and connections to the outside world (displays, printers and so on).

> ”
>
> *When buying software, consider issues including hardware,. operating system and the potential for growth.*

In the IBM PCs, the processor consists of a member of the Intel Corp. 8086 family of microprocessors (8088, 8086, 80186, 80286). The smallest of these, the 8088, was initially designed into the PC to achieve the lowest cost at some sacrifice of performance. This processor was well-matched to the relatively small memory and generally slow peripherals such as the floppy disk drives offered with the original PC. In the Personal Computer XT, the limitations of the 8088 became apparent when the higher-speed hard disk was added to the system. Other manufacturers, notably Compaq Computer Corp., addressed this imbalance in system performance by using the 8086, which has total functional compatibility with the 8088 but a faster 16-bit bus, twice the width of the 8088 bus.

The Intel 80286 is a much more advanced processor than its predecessors but retains a compatibility mode (called real address mode by Intel) so that older software can run on it. The Personal Computer AT takes advantage of the 80286's extra speed and its wider bus but uses the compatibility mode to run existing software written for earlier members of the PC family. This is the same strategy IBM employed when it introduced the 360 series with 1401 emulation in 1964. Just as 1401 programs could not take advantage of the then-advanced capabilities of the 360, 8088 and 8086 programs running in compatibility mode cannot take advantage of the advanced capabilities of the 80286.

The most important architectural advances in the 80286 include support for very large amounts of real memory (16M bytes vs. 1M byte in the 8086); support for multitasking; and support for protected virtual memory to keep programs from interfering with one another and the operating system. In this respect, the 80286 compares very favorably to modern minicomputers.

All of this hardware capability is available to an applications program only if the operating system makes it available. The operating system used by the vast majority of PCs is Microsoft Corp. MS-DOS (sold by IBM under the name PC-DOS). This operating system was designed to support single-user, single-tasking applications. It does not utilize any of the advanced capabilities found in the 80286. Therefore, putting a 80286 in an MS-DOS PC is analogous to putting a turbocharger in a Volkswagen Beetle — it may be fast in a straight line, but it's still a Bug.

If we examine the way software developers (and their management) work, most have more than one task in process at any given time. On a developer's desk there may be documents relating to analysis, design and new code development for one project or several. It makes sense to have tools that support the way people actually work — tools that allow several activities to take place in parallel. However, MS-DOS only allows one program to run at a time. True multitasking is difficult, if not impossible, to do with a single-task system like MS-DOS.

To get around some of these limitations, windowing systems have been developed that run on top of MS-DOS and mimic multitasking behavior.

Examples include Microsoft Windows and Digital Research, Inc.'s Graphics Environment Manager. These systems still cannot take advantage of the enlarged real memory, multitasking and protected virtual memory features of the 80286. Programs and the operating system must contend with each other for the limited real memory of the basic PC architecture (the much-discussed 640K-byte barrier). It is also quite easy for a faulty program to bring down the entire system and

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cause data to be lost.

The shortage of real memory constrains not just multitasking but also individual applications programs as well.

### Intel/Lotus/Microsoft EMS

One well-publicized attempt to deal with the memory space problem is the creation of the Intel/Microsoft/Lotus Expanded Memory Specification (EMS). A block of the normal PC memory is assigned to a set of buffers that hold data from a potentially larger extended memory. (The term buffer reflects how EMS appears to an application, not necessarily how it is implemented.) The use of these buffers to access information in extended memory is handled by each application. Several limitations to this scheme include the following:

- Access is restricted to data only — programs cannot run in extended memory.
- The buffers are small (16K bytes), so applications can only get at relatively small parts of the data at a time.
- There are only four buffers, so they become a scarce resource. If multiple applications are simultaneously running in a windowing system, they must agree among themselves on how the buffers are to be used because the operating system cannot control their use.
- EMS does nothing for the protection problem (keeping one program from bashing the code or data of another).

So while EMS helps to deal with the problem of growing spreadsheets, it does little to help large programs (such as complex systems development tools) run in an MS-DOS environment. Interestingly, EMS has its roots (like many aspects of microcomputers) in the mainframe and minicomputer world. The basic technique it employs is called bank switching, which was tried for many years with limited success before being discarded in favor of demand-paged virtual memory.

Software designers are involved in development activities analogous to those of hardware designers. Current research and past experience in CAD and CAE have shown that the efficiency of the design process is proportional to the amount of information available to the designer. While the design objects may differ (for example, entity-relationship diagrams in the software realm and floor plans in architecture) and the ratio of text to graphics may differ, the need for simultaneous views of multiple objects remains. To meet this need, a software engineering tool should take advantage of a truly high-resolution display.

Modern CAD and CAE systems rely on displays capable of showing at least 800,000 pixels, typically in a 1,024- by 800-pixel format. This allows viewing of complete objects like a printed-circuit board, an airplane or two pages of text side by side.

Contrast this with the typical high-resolution PC display that can show only 25% of this information. A windowing system running in such a display can only show small fragments of diagrams or documents, leading to much panning and scrolling on the part of the user.

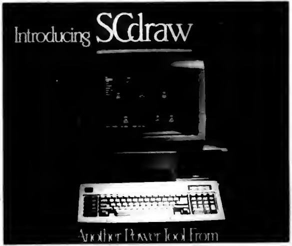
Very high-resolution displays can be attached to standard PCs, but because there are no standards for these devices, there is also no MS-DOS and varying or nonexistent applications support for them. In addition, performance usually suffers because the PC becomes overwhelmed with updating the screen. Also, because many objects can be displayed on a larger display, it is natural to want to operate on them simultaneously. This natural mode of interaction with a computer system requires multitasking support for a successful implementation.

One the most critical aspects of any development effort is making sure that all members of the project team have access to the same up-to-date information. In a traditional centralized computing environment (either on a mainframe or a minicomputer) this is possible because the data is centralized. However, each user's performance is affected by other system activity.

Personal computers help to provide a consistent computing resource for each user, but data is not easily shared among a team of users. Local-area networks currently exist to connect personal computers, but actually achieving data sharing and task-to-task communications requires special applications programs and operating system support. Sometimes, dedicated machines are required just to provide network capabilities.

Local-area networks are also not standard between personal computers. Like displays and memory extension standards, the capabilities, costs and level of support for personal computer local-area network vary widely.

The use of PCs is widespread in today's computing environment. The machines offer the



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ability to bring computing capability to the end user for a relatively low price, and they excel at many tasks such as spreadsheet manipulation and word processing. For these reasons and to control the proliferation of incompatible hardware and software, many companies have standardized on personal computer equipment configurations.

Unfortunately, not all applications work well on the same computing hardware. As noted above, software designers have much in common with other engineering users who have known for years that workstations are more productive for their design tasks than personal computers. The job that they are trying to do demands a more capable resource than can be provided by a personal computer-based solution.

> ”
>
> *PCs remain suitable for small application development projects that require a minimal amount of manpower.*

A user in the standardized personal computer environment is not totally out of luck. For small projects, PC-based tools may be adequate. However, be prepared to invest in nonstandard networking solutions if you want to share data and also be prepared to outgrow the PC-based solution as the problems you try to solve and the required tools to solve them get bigger and more complex.

### A more ambitious approach

A slightly more ambitious approach is to modify existing PCs to overcome deficiencies. You can add memory, larger displays, larger and faster disks, network connections, but unless you also change operating systems, many of these additions cannot be used. This approach also leads to a mostly nonstandard environment (where only the power supply, cabinet and keyboard are original equipment) that is hard to support.

Some conservative users will take a wait-and-see approach in anticipation of a new PC based on the Intel 80386. Such a machine, they hope, will address many limitations on PCs. In addition, it would allow older software to run but without compromising the features of the new machine.

The irony is that thousands of machines with all of these features exist and are in use today but have been largely ignored by the business market: engineering workstations.

The IBM RT Personal Computer; Apollo Computer, Inc. DN3000; Sun Microsystems, Inc. Sun 3; Digital Equipment Corp. Vaxstation; and the Hewlett-Packard Co. 9000 Series 300 are all off-the-shelf, fully supported products that provide platforms for software engineering tools.

These machines provide a similar level of performance to the hypothetical 80386-based machine. While their processors may vary, it is of little or no importance to applications written in high-level languages. Performance counts, not part numbers.

Many of these workstation products are in their second or third generation and have had the benefit of feedback from thousands of very demanding and technically astute users. In addition, some of these machines are available in quantity for well below $10,000 each, providing four to six times the performance of a PC AT, high-resolution graphics and integrated networking at a competitive price.

The IBM RT PC, for example, has a processor that currently runs at 2 million instructions per second, about equal to a mid-range 4300 series mainframe. It supports up to 4M bytes of real memory and a virtual address space of 1 terabyte (which is larger than IBM's mainframe offerings). It can be configured with up to 210M bytes of disk storage and its operating system can support multitasking and multiple users. In addition, a coprocessor option is

When You Investigate The Spectrum Of Possibilities, You'll Choose Compuware.

available to run MS-DOS applications.

The Apollo DN3000 is a similar machine offering display and networking capabilities and very attractive pricing. A DN3000 with a 1,280 by 1,024 monochrome display, 4M bytes of random-access memory, a 70M-byte Winchester disk, a 1.2M-byte floppy disk, network hardware and a multitasking operating system is available for approximately $16,000 in single quantities. Because demand-paged virtual memory is supported across Apollo's high-speed local-area network, a hard disk is not required for each workstation. Without a disk, a comparable DN3000 costs about $11,000 in single quantities.

These machines compare favorably to a highly modified PC AT configuration while they provide better performance and offer the advantages of full integration of all components and complete factory support Later this year, an MS-DOS coprocessor is expected to be available for this machine.

### Federal Express' case

Federal Express Co. is an example of a company that has automated much of its software development environment. Its software systems must handle more than 80,000 invoices and track 150,000 phone calls every day to ensure that their overnight delivery packages arrive on time and their customers are billed quickly and accurately. To do this, Federal Express uses more than 20,000 on-line terminals. This reality makes maintaining existing applications and developing new ones a major challenge to its staff.

Using a workstation-based tool, Federal Express has estimated more than a 100% increase in productivity for certain phases of its development process. Previously, manual methods would have meant a typical expenditure of four manweeks to perform completeness and quality-checking tasks on a system specification. Using its workstation-based tool, these tasks can now be completed in about 10 minutes.

Due to significantly increased productivity and faster applications development, Federal Express estimates the payback for this workstation-based system will take less than one year.

With a wide range of workstations and personal computers to choose from, DP/MIS management must select the environment that will best increase the productivity of their software developers. While PCs remain suitable for small projects that require a minimal amount of manpower, they lack many of the features needed for the development of today's large, complex applications.

> ”
>
> *Workstation-based tools provide the capabilities needed for complex applications development, now and in the future.*

With the prices of workstations nearing those of high-end PCs, performance becomes the most critical factor in selecting a development tool. It is clear that workstation-based tools provide the best capabilities needed for complex applications development, now and in the future.

Workstation-based tools are being recognized as significant contributors to improved productivity. In the future, the distinction between PCs and workstations will disappear as PCs evolve to the level of today's workstations. However, many organizations need help now. These firms can greatly benefit from workstation technology today, but only if they are willing to look beyond PC-based solutions. ■

*Mazzucchelli is chairman and cofounder of Cadre Technologies, Inc., a manufacturer of workstation-based automated software development tools located in Providence, R.I. Fleming is vice-president, research and development, of Cadre Technologies.*

4.

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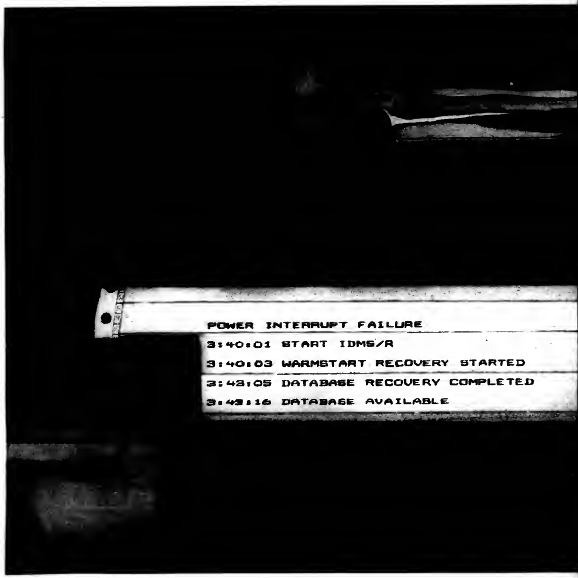
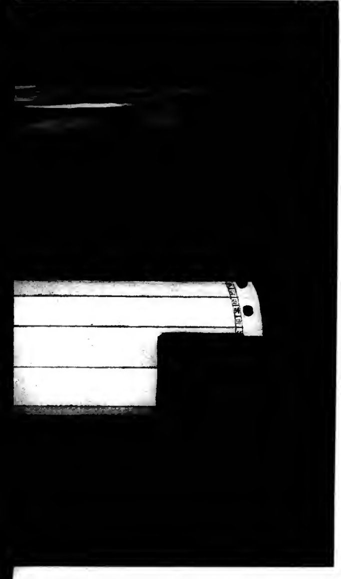
# handle a



```
POWER INTERRUPT FAILURE
3:40:01 START IDMS/R
3:40:03 WARMSTART RECOVERY STARTED
3:43:05 DATABASE RECOVERY COMPLETED
3:43:16 DATABASE AVAILABLE
```

# your database system crash?



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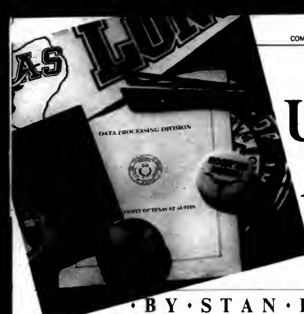


## CORPORATE ACCOMPLISHMENTS

# Users Shine At Lone Star Campus

### • BY • STAN • KOLODZIEJ •

In an age of MIS stories documented by long applications backlogs, maintenance problems and user dissatisfaction, a bright light is shining from the Lone Star State at the University of Texas, Austin.

Consider these facts: Within five years, with a minimum of heartache, the university's administrative arm has gone from a traditional, centralized Cobol shop to a distributed resource operation via a fourth-generation language and development tools; more than 40,000 programs now exist at the Austin campus, almost all written in a fourth-generation language, a good number of which were written by end users; a synergy of cooperation and communication seems to exist between end users and the data processing department that is genuine and thriving.

If people can learn by example, then the university's situation is a case in point for those who advocate that successfully integrating computers into the fabric of organizations is as much a question of attitude as technology.

Though the school's computing environment is unique in many ways, there are also factors that are shared by other organizations both in the private and public sectors.

The first is size. The university's Austin campus caters to 48,000 full- and part-time students and thousands of administrative employees. There are 200 departments, 1,200 computer terminals and about 2,600 active computer users. The data bases and applications can be formidable: the housing administration keeps track of nearly 6,000 apartments, for example, and there are, at last count, about 120,000 active student records. About 400,000 computer transactions are handled campuswide each day.

Robert Simpson, director of the data processing division, explained that keeping track of student records and course scheduling alone is like handling the heavy throughput of airline reservations.

The university also shares some history with many DP organizations. Automating in Cobol in the 1960s, the university ran into problems with application backlogs and what Wes Henderson, head of operations, termed a communication gap with users.

At that point Simpson was brought in as director to try and turn things around. A primary goal was to bolster the confidence of the DP staff and users. Meetings were frequently held to produce monthly application schedules and prioritize programs. DP staff was increased. The first data base system was put in place.

Henderson said things improved, but there were still problems. "We came to realize there was probably no single DP department in the world that can get a backlog down without help from the users," Henderson explained. "We thought a large part of the work had to be distributed out to the users. We also thought the best way to do it was through a fourth-generation language."

According to Simpson, "In the past we had serviced not the end user but the person servicing the end user. There were a lot of departments here that felt that the university existed so they would have jobs. These departments didn't want to give service to the end user and we [DP] were caught in the bind."

> *The University of Texas, Austin, has achieved a synergy of cooperation and communication between end users and the DP department founded in the belief that integrating computers into the fabric of organizations is as much a question of attitude as technology.*

Several years ago Simpson and others decided to begin converting existing Cobol programs into Adabas, a fourth-generation relational data base from Software AG of North America, Inc., and all new programs would be written in Natural, Software AG's fourth-generation programming language, bringing much of the programming into the hands of the users.

In the meantime, the groundwork for a new style of communication between end users and the university's administrative DP department was under way. A large part of the change in communication, according to Simpson and Henderson, can be traced to Lawrence Hall, manager of programming services and the one responsible for DP hiring.

Hall has been interviewing DP hopefuls since the late '60s. He has also honed a definite set of character traits that he looks for in new people before they are hired. "We'll probably see 150 people before we hire one programmer," Hall said. "We want great listening skills, good communication skills and the right attitude. Attitude is a belief, not a feeling. The person we hire has to be accessible to end users. We are very permissive with our people, and we don't target a trainee for a specific area. What we don't want to do is define that individual to a point where he has to live up to all his definitions."

Hall's careful screening has paid off over the years. Almost everyone who has passed through the DP side has been hired by Hall, and there seems to be a remarkable commonality in the sense of mission of the DP staff.

Besides such character compatibility, the tendency is to hire people with little or no programming experience, unusual for most DP shops. The programming skills of the new people are then gradually nurtured through extensive in-house training, educational programs and work in the field with end users. New staff members become adept at programming in Natural after about three months, and with further experience can become systems analysts after 18 months on the average.

In most cases, experienced programmers and analysts coming from outside the university need not apply. "I find that many programmers and analysts coming from other jobs often have preconceptions, a sort of tunnel vision about who they are and what their role is with the end users," Hall claimed. "We offer opportunity paths here, not career paths.

We're not in the supervisory business. That's when organizations get large, and we want to stay lean."

New DP staff members may have backgrounds in English, mathematics, linguistics, whatever. They bring with them little baggage of what a data processing organization is and what it should do. "That allows us to encourage open communication with end users," Hall added.

Such communication is strengthened, however, by another unusual approach to end-user/DP relations. Over the years, as the larger university administrative departments bring applications on-line, DP programmers and analysts are seeded within these departments to become full-time departmental DP employees — and users. The placing of DP talent among user departments has patently helped build a flow of communication between DP and end users that exists at the university today.

'In the past we had serviced not the end user but the person servicing the end user.'

**— Robert Simpson**
**director, DP division**
**University of Texas**

"It's always better if a person understands what users are going through," Hall explained. "You have to understand the impact computers can have on users. I call it the 'law-of-the-beast syndrome.' [Users say,] 'They're going to come and plug this beast into the wall, and if I don't do it right, then this machine will chew my hand off.' As a rule, users fight change; they're secure in their manual methods. So you have to be flexible, you look at the needs of the users because they're the ones who are going to determine what you do."

The flow is not all one way, however. Users are encouraged to take advantage of DP training sessions to acquire programming skills, and the DP department makes available six consultants who go into the field to help users with applications. An information center, employing two full-time staff, fields questions by phone. Several end users also provide voluntary time at the information center each week.

John Camden, systems analyst and information center officer, said the center is as much a concept as a facility. "To me there is no such thing as a terminal and a mainframe, only computer systems," Camden explained. "The goal of our data processing department is not to own any files. Users own the files, and we give them the tools to manage the data. Control is with users, and even most of the documentation is done by them. There are centralized systems, distributed systems and shared resources. We're the latter."

According to Hall, "The whole thing is to get away from the traditional three-party system. Usually, you have DP and the users on one end and the data base on the other end. Users had to speak to a consultant or programmer who would go to the data, massage the data, then bring the answer back to the user. We're evolving into a two-party system, just the users and their data. DP is a consultant to that process. Like anything, the closer you get the users to the data, the more they'll understand what they want and the more responsibility they'll assume."

A good example is Connie Schade, a programmer in the university's Health Center. Originally supervisor of medical records at the center, Schade became a programmer and soon began writing various programs such as inventory, billing and physician tracking in Natural under the guidance of DP. Schade is also in the process of creating several insurance-related programs to help speed medical payments.

Linda Casarez, in charge of the university's job applicants division, is another user who has worked with DP to create some tight, integrated applications. During a peak hiring period, there will be as many as 4,500 active applicants in the job applicants system pursuing any number of positions open within the nearly 530 job classifications on the campus. Casarez has helped create a series of programs that assemble and collate applicant data, then automatically produce and update daily counselor reports and correspondence with applicants. From this data, further programs generate statistical reports on applicant profiles for use at the university as well as state and federal government agencies.

Some departmental applications at the university can get big. Physical Plant has created a large maintenance system in Natural that keeps track of more than 8,000 pieces of equipment, printing out schedules two weeks in advance that tell employees what pieces of equipment have to be checked and what items have to be looked at. Further reports that tell whether the maintenance has been done are then automatically generated.

The next project at Physical Plant will involve creating an on-line campus billing system for students making long-distance phone calls that will be tied into the campus Northern Telecom, Inc. SL-100 private branch exchange.

With 40,000 programs already out there, however, and a growing backlog of new program requests, there has to be some guiding, centralized control.

Programming standards for such things as naming conventions, systems designs and screen designs are documented by the DP side, although John Wheat, in charge of departmental accounting, said a special effort is made to account for exception reporting, and the standards committee also includes many users.

Most proposed departmental applications are screened by DP as to their feasibility, but again, there is leeway given. "We err on the side of the user," Camden said. "To build an on-line system requires an Adabas file that needs approval by data processing and the vice-president of business affairs. To get a file approval users have to have a file design. Seven of every 10 user applications might be disasters. Those three [user] applications that succeed, however, are worth the failures."

Maintenance and efficiency reviews are handled on an ongoing basis and kept track of through utility programs that produce reports logging the departmental uses of data base records and files. Inordinate usage is traced to the source, where DP staff can often help users streamline programs and make better use of data.

According to Mark Miller, a systems analyst, "In many cases it's just a matter of putting more descriptors on the files, and in some cases the result has been dramatic, decreasing the number of user calls for a file from hundreds of thousands to perhaps 10,000."

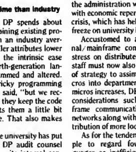
### Less maintenance time than industry

Miller added that DP spends about 35% of its time maintaining existing programs compared with an industry average of about 60%. Miller attributes lower maintenance time to the intrinsic ease with which the fourth-generation language can be programmed and altered. "We can do some tricky programming with Natural," Miller said, "but we recommend to users that they keep the code simple even if it costs them a little bit more in program size. That also makes maintenance easier."

In the past year, the university has put in place an internal DP audit counsel whose mandate is to write internal controls and operational audits for the Austin campus.

Campuswide systems such as departmental accounting and student affairs provide centralized financial data used by a number of departments, access to which is delineated and controlled by file and field security levels through a software traffic controller called DPuser, which was developed in-house and resides on the IBM 3081 mainframe.

The departmental accounting system, in fact, has been a proving ground at the university for other users. "We were the first big users group," Wheat said. "We came up with the command-driven, menu-augmented dispatcher module architecture that's the standard around here. It accommodates two levels of users. Novice users can use menus if they can't remember the commands. More experienced users can bypass menus and get from function to function in the system by a chain of commands."



'The [programmers] we hire have to be accessible to end users.'

**— Lawrence Hall**
**manager of programming services**
**University of Texas**

Despite its successes, the university's transition to a fourth-generation language hasn't been all gravy. The DP side has had to deal with a recalcitrant payroll department in the past (though they say payroll is now a big supporter), departments have tried to place their own computing interests ahead of others and there was even a surprisingly large resistance to the removal of an impact printer that was replaced by a laser printer.

"Perhaps the lines of communication aren't as clear as they might be," one systems analyst explained. "Users are often not clear as to whether something is a standard or just a suggestion from DP. Or, if it is a suggestion today, will it be a standard tomorrow and will users be held responsible for the fact that they didn't follow last year's suggestion. This is an interesting flip of the usual DP stance saying they can't change. At the university, it's DP saying there must be change, and it's the outside that is sometimes unable to cope with it."

Despite optimism expressed by the DP department at the University of Texas, the administration will also have to cope with economic repercussions from the oil crisis, which has helped put a temporary freeze on university hiring.

Accustomed to a centralized, terminal/mainframe computing site with a stress on distributed resources, the DP staff must now also formulate some sort of strategy to assimilate the flow of micros into departments. As the influx of micros increases, DP will have to address considerations such as micro-to-mainframe communications and local-area networks along with the creation and distribution of more localized data bases.

As for the tendency of many MIS people to regard fourth-generation languages as inefficient, Simpson quickly dismissed the notion. "One of the big complaints is that fourth-generation languages create bottlenecks with I/O," he said. "We've found the opposite. If we go in and convert an application to Natural [from Cobol], the I/O on the CPU should go down on the application. We've never had problems."

The achievements of the administration's computing facilities are no doubt due as much to attitude as anything else. As more departments and users came on-line through the years, the administration has avoided some of the common pitfalls and mistakes that have come back to haunt many other MIS departments in the form of user estrangement and lack of common goals.

The school's experience might be a lesson in the value of making sure the lines of communication remain open.

"If you tie 2,000 people out there to terminals, you're looking at 2,000 nervous stomachs," programming services manager Hall concluded. " But you're also looking at 2,000 potential programmers."

*Kolodziej is a senior writer at* Computerworld Focus.

## SPECIAL SECTION: PRODUCTIVITY SOFTWARE

# Making A Case For CASE

DAVE RIDLEY

### BY ALBERT J. CONNOR & ALBERT F. CASE JR.

Computer software has now joined the major league in business problems for the 1980s and 1990s. The challenge for corporate America in a growing information and service economy is to build reliable software faster.

The need for more software, however, does not translate into an automatic increase in systems development budgets and staffs. Instead, senior corporate management is demanding increases in productivity from all the areas of business, including systems development. This translates into a need to get more and higher quality software from each system developer.

The systems development industry has seen a steady growth in the application of technology to the problem of systems development. Third- and fourth-generation languages, better source code editors, application generators and data base management systems (DBMS) have all contributed to improving productivity. These technologies, however, focus on only part of the problem — programming. Until very recently, analysis and design have not benefited from the same technological advances.

The main emphasis in analysis and design has been on building better, more reliable systems through the application of engineering disciplines such as structured analysis and design and data structured design techniques. Structured techniques result in lower maintenance requirements through more modularity in design. They also result in systems that more closely meet the needs of end users. These disciplines, however, are tedious, highly labor intensive and time consuming. Their impact in terms of productivity is long term.

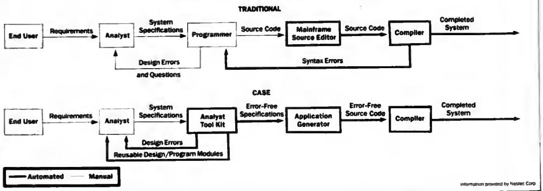
Perhaps software developers can learn some lessons from the electronic and mechanical engineering industries. Like software development, these engineering disciplines follow a life cycle or orderly series of predefined tasks to achieve their design objectives. These industries first focused on improving productivity by automating tasks later in the life cycle, tasks related to manufacturing the products the engineers designed. The domain of these tools was the factory. Later, as the engineering disciplines matured, they began automating the design functions for mechanical and electronic components, tasks performed by the engineers themselves earlier in the life cycle.

The earliest systems used computer-aided drafting, which assisted in the development of mechanical and electronic component diagrams and schematics. Later these systems evolved to using computer-aided design and manufacturing for mechanical engineering and computer-aided engineering (CAE) for electronic engineering. CAD/CAM/CAE systems went far beyond merely drawing circuit diagrams and blueprints. They included programs for analyzing the diagrams to detect errors in the design specifications and included bill-of-material processing systems to identify and catalog reusable electronic and mechanical subassemblies. In addition, many CAD/CAM systems directly controlled some aspects of the manufacturing process such as automatically programming numerically controlled machine tools. The latest generation tools, called computer-integrated manufacturing (CIM) tools, include CAD/CAM/CAE functions as well as management information features for project and manufacturing control and capacity planning.

The benefit of the CAD/CAM/CAE and CIM systems include improvements in the quality of the product and increases in engineering and manufacturing efficiency. These benefits are proven by the dramatic price/performance improvements in computer hardware systems over the last 10 years, a feat that never could have been achieved without the application of these technologies.

The software development industry is undergoing a similar pattern of automation. Like other engineering disciplines, software development first began automating the later tasks in the life cycle through improvements in

**Software Development: Traditional vs. Computer-Aided Software Engineering (CASE) Method**



Information provided by Nastec Corp.

programming technology. Sophisticated third-generation language compilers, fourth-generation languages, DBMS and program/application generators have been around for some time and are widely used in the computer industry. These automated tools focus on the software "manufacturing" process — programming. Like any other manufacturing process, programs must be designed. Improved programming technologies allows programs to be developed more rapidly. However, these advances do not assist in reducing the labor intensity and tedium of performing analysis and design tasks. Poorly designed programs require significant maintenance. With improved programming technologies, developing poorly designed programs faster simply compounds the maintenance requirements.

Structured design techniques improve the quality of software and, subsequently, reduce maintenance. The drawbacks to these techniques lie in their complexity and labor intensity. These drawbacks frequently lead to shortcuts that get the projects completed faster but do not necessarily have the desired effect of increasing system reliability and reducing maintenance. Like electronic and mechanical engineering, software analysis and design can benefit from automation early in the life cycle.

### The first step

Like computer-aided drafting for engineering, early attempts to automate software design focused on documentation. Products for creating diagrams, flowcharts and narrative specifications emerged in the early 1980s. Economically feasible tools for processing both graphics and words were made possible by the emergence of powerful, low-cost micros.

Two of the early tools in this area were Nastec Corp. Graphitext and McDonnell Douglas Automation Co. DFD-Draw. These tools enabled developers to develop and modify specifications quickly. They provided the first opportunity for software developers to create structured specifications on-line, reducing initial specification time by 15% to 20% and documentation revision time by up to 60%. These early documentation tools introduced a whole new class of automation for software development. This emerging technology has been labeled computer-aided software engineering (CASE), a term coined by John Manley, director of the Software Engineering Institute at Carnegie-Mellon University.

In 1983, emerging CASE systems provided not only computer-aided drafting and, occasionally, WP, but actually validated the specifications created to ensure completeness and accuracy prior to programming. These CASE tools decrease the time to create and modify specifications and substantially reduce the labor intensity and complexity of using software engineering disciplines (see chart). The tedious and repetitive tasks of cross-referencing documentation, balancing various design documents and eliminating redundant design specifications are automated with CASE. Now software engineering techniques are more efficient. Design flaws can be detected with a high degree of accuracy and corrected early in the development life cycle when correction costs are the lowest. CASE system cross-referencing design dictionaries or design data bases make location and reuse of design and program modules feasible through automated reporting. These systems can reduce design time by 50% or more while still yielding high-quality, error-free program specs.

The closest engineering analog to CASE is CIM, which includes tools for engineering as well as tracking and control. Similarly, sophisticated CASE systems include tools for planning a project, directing the work of developers through on-line communications, controlling and securing the specification data base and automating software quality reviews. These CASE systems include subsystems that manage the entire software development life cycle. Linking management tools to the software engineering tools, these advanced CASE systems become complete management information systems for software development.

## Selecting A CASE System

The following is a list of features that can be found in computer-aided software engineering (CASE) systems and environments:

- *Computer-aided drafting.* Features for creating graphics and narrative documentation.
- *Computer-aided design.* Features allowing the computer to analyze specifications for completeness and accuracy.
- *Design data base.* A design data base in which the specifications and cross-reference information is stored.
- *Integrated programming tools.* Program or application generator interfaces that capture input from the design specifications, eliminating redundant entry.
- *Management.* Tools to manage the development process that share a common data base and interface with the design and programming tools.
- *Human factors.* Supporting the system by the best educational and technology transition support.

Management can assess the impact of requesting a change to a specification of a current system by inquiring against the design dictionary. This information coupled with the availability of a program and specification "parts catalog" of reusable components yields more accurate software project estimates.

The successes of computer-aided technologies for engineering and manufacturing are proven. They have substantially contributed to the recent revival of the U.S. automotive industry through decreased manufacturing costs and higher quality consumer products. Similarly, the application of CAE to electronic hardware design slashed prices while boosting performance.

Looking at the future of CASE technology, some exciting developments are on the horizon. For example, this year CASE analysis and design systems have been interfaced to Cobol application system generators, marking the first interface between design automation and programming automation. The merger of these technologies means that 80% to 90% of the final system can be generated directly from the design specifications. This new level of CASE technology could be described as a specification compiler. The specification compiler accepts structured specifications as input, checks the design syntax and translates the specifications into a programming language. This process has long been accepted as the way to translate human-written programs into machine instructions. The drawback has been the inability to get the structured specification into machine-readable form, a problem solved by CASE. The benefits of a specification compiler are much greater than those achieved through the use of third- and fourth-generation languages.

Another bright spot in the future of CASE technology is expert system technology, a branch of artificial intelligence. Simply stated, expert systems transform a professional's knowledge to a set of rules stored in a knowledge base. The expert system program (shell) then processes data according to rules in the knowledge base — allowing the computer to solve more complex problems than previously possible.

Software engineering is an excellent candidate for the application of expert system technology. The creative and challenging aspect of software engineering is in defining users' problems and requirements. Much of the remaining work in analysis and design is transforming those problems and requirements into a design, transforming the design into programs and transforming the programs into working machine instructions. Incorporating expert system capabilities in CASE systems frees the developer to concentrate on the creative tasks in software engineering and delegates the routine transformations to the computer.

CASE technology enables software developers to take aim at the problem of software development productivity — increasing efficiency, improving quality and reducing maintenance. At last, software developers as well as their end users can achieve productivity improvements through the use of computer technology.

*Case is director of Consulting and Education Services for Nastec Corp., Southfield, Mich., and author of* Information Systems Development: Principles of Computer-Aided Software Engineering *(Prentice-Hall, 1986). Connor is vice-president of Market Development for Nastec.*

## SPECIAL SECTION: PRODUCTIVITY SOFTWARE

# Betting On 4GLs Or Cobol

DAVE RIDLEY

### · BY · N. · ADAM · RIN ·

User experience with fourth-generation languages has now been substantial, with results not entirely in line with early expectations. While productivity gains are real, the hope that these languages would quickly replace Cobol has not been realized.

An examination of productivity tools now being installed shows that they include a substantial number of Cobol program generators as well as fourth-generation languages. This suggests that there are certain pragmatic reasons for adopting a Cobol program generator or a fourth-generation language, depending on the application, objectives and corporate attitudes toward various classes of tools.

The implications of introducing productivity support systems are of particular importance to two groups of DP professionals: those who are currently in the process of evaluating and selecting high-productivity tools and those who are selecting a data base management system and may wish to install a fourth-generation language or other productivity tool either concurrently or later. This is because there is often a strong link between development productivity systems and DBMS.

End-user fourth-generation languages are of two types, although there can be overlap between the two. They can be either language driven or forms (menu) driven. Typical examples of the language-driven systems are Martin Marietta Data Systems Ramis II, Information Builders, Inc. Focus and D&B Computing Services, Inc. Nomad2. Forms-driven (menu-driven) products usually have a retrieval and reporting orientation and include IBM QMF and Computer Corporation of America's (CCA) Access/204.

Despite vendors' claims, these systems are not really suitable for building major transaction processing applications but are useful for many other purposes. Language-based products can be used very effectively for applications where simplicity is characterized by both functionality of the system and volumes of data to be handled.

The menu- and forms-driven products can be used for applications that do not require an algorithmic capability or the processing of heavy volumes of data.

The restriction on the use of these systems is partly due to the fact that they do not possess the functionality of a full programming language.

Furthermore, language-based, end-user fourth-generation languages often offer a simplistic syntax that may not be suitable for complex applications. It is even possible that for a complex algorithmic application you could write more lines of fourth-generation language spaghetti code than you would using structured Cobol because some end-user fourth-generation languages lack structure, standards and methodology, which may also lead to maintenance problems. Typically, these systems are excellent for the kind of information center use for which they were originally designed. They often have interfaces to DBMS that improve their usefulness; some have even started growing their own embryo DBMS facilities.

As they develop, the difference between end-user and other fourth-generation language offerings is becoming blurred. However, because they do not offer a full functional replacement for Cobol, these tools are not considered suitable for building major production applications.

Production program generators are a full functional replacement for Cobol. The products are fundamentally Cobol generators and include CGI Systems, Inc. Pacbase; Pansophic Systems, Inc. Telon; CCA Accolade; and Tarkenton Software, Inc. Gamma.

For a long time this type of productivity aid had been written off because the sense was that Cobol was old technology. However, there has been a resurgence in demand for Cobol generators, primarily because of the perception that they can offer a simple and safe way to achieve productivity gains.

The overselling of fourth-generation languages by some vendors and consultants as well as a history of misapplication has led a number of installations to become distrustful of these tools. The perception that fourth-generation languages have failed to meet their promise has helped bolster the case for the program generator. Program generators offer real productivity gains, relative to using native Cobol, with a minimum of disruption.

In terms of facilities, program generators interface with traditional files and typically with one or more DBMS. Human engineering is in the form of interactive and forms-driven facilities for data definition, screen definition and procedure definition. Some program generators are available in PC versions — such as CCA's Accolade/PC — as well as on the mainframe. These versions permit IBM PCs to be used as workstations for development and testing so that the completed application can then be uploaded to the mainframe for production implementation without change

Production application fourth-generation languages differ from end-user fourth-generation languages in that they are offered as complete functional replacements for Cobol, including being suitable for on-line transaction processing applications. The major difference between the two types of production application fourth-generation languages is that some are integrated with their own DBMS while others are interfaced to other vendors' DBMS.

Examples of products that incorporate their own fourth-generation language and DBMS include Applied Data Research, Inc.'s Ideal with its Datacom/DB; Computer Corporation of America's Workshop/User Language with its Model 204; Cullinet Software, Inc.'s ADS/Online with its IDMS; and Software AG of North America, Inc.'s Natural with its Adabas. These products are all intended for building major production systems. In addition to providing an interactive means of defining data and screens, these systems include a language that is at a higher level of abstraction than Cobol.

A second important feature is that these languages are packaged with the vendor's DBMS. The extent of the actual connection between the language and the DBMS varies substantially, ranging from an interface to complete integration; this in turn affects performance, ease of use and other usage characteristics.

> ”
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> *Given the range of productivity tool options, users must determine what they really want and what they are prepared to compromise to achieve desired results.*

Examples of production application fourth-generation languages that are independent of a particular DBMS include Pansophic Systems Gener/OL and Martin Marietta Data Systems UFO. This category of system is also offered as a functional replacement for Cobol, and such products typically work with IBM's VSAM and IMS so as to take advantage of Big Blue's shortcomings in the fourth-generation language area.

These systems have much more functionality than report writers. The nature of their links to DBMS vary, and, because the linked systems come from different vendors, the level of integration may not provide the same ease or efficiency of tools such as that found when all systems have been developed together.

Production program generators and production application fourth-generation language tools have certain facilities in common. Data definition is typically dictionary-based and carried out interactively using forms-driven processing. Screen definition is performed in a similar way using screen painting techniques. In addition, most offer ways of writing both transaction and batch procedures. However, there are differences between program generators and fourth-generation languages in terms of how procedures are written, the level at which the language operates and the development environment that each creates around it.

Program generators enable programmers to continue more easily with their established procedures and to continue to support existing standards but in a more productive way than native Cobol. Fourth-generation language products enable users to execute an application interactively and as it is written.

Given a range of productivity tool options, it is essential for users to determine what they really want and what they are prepared to compromise to achieve desired results.

There are those whose DBMS plans might short-circuit any other fourth-generation language selection process. Others need to determine what their specific needs are in relation to productivity, performance, class of application and level of change their installation can support in moving toward those goals.

It is reasonable to assume that anyone with an interest in improving productivity over writing new applications in native Cobol would consider one or both of these classes of products. Starting from that premise, it is worth assessing the immediate considerations.

First, an installation cannot move from writing native Cobol to any of the productivity tools overnight. There are many factors to consider, including the fact that systems currently under development are probably better left in their native Cobol state.

In addition, there is a need to maintain Cobol programs that will continue. Also, those programmers earmarked for working on a new system will have to be trained and will go through a transitional phase while they hand over their earlier work to others.

A multilevel approach needs to be developed that could include a move to a program generator for certain applications; the introduction of a production application fourth-generation language for others and to pave the way into the future; and the possible acquisition of an end-user fourth-generation language for information center work.

A comparison of the unique benefits of using a program generator or a fourth-generation language is one way that helps to show which starting approach is preferred. One of the benefits of using a program generator is the

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## SPECIAL SECTION: PRODUCTIVITY SOFTWARE

sense of security that comes from working with a language that is understood and that minimizes MIS' ties to a particular vendor. Another is the greater familiarity of the process because development style does not change as much.

Evaluators, however, should be careful not to overestimate the extent of these benefits. Many products generate Cobol that is so cryptic as to be unusable at the object level. There are also some fourth-generation languages that are so unstructured and cryptic that they are hard to maintain at the source level. It is likely every viable DP department is going to make a move to fourth-generation languages for at least some of its development.

Another benefit of generating Cobol is that it is more portable than fourth-generation language-produced systems. Again, though some fourth-generation languages can demonstrate functional and performance parity with Cobol, the genre as a whole is sometimes regarded as immature. This may be enough to cause some managers to hesitate before introducing the technology.

In all, for many applications, program generators may not offer the same degree of productivity gains, but they are certainly a lot more cost effective than using native Cobol. In fact, they offer twofold to threefold programming productivity gains. Furthermore, a Cobol program generator may give a greater degree of flexibility in its procedures and through its Cobol source generation than many fourth-generation languages when solving problems for which a fourth-generation language does not offer any particular advantage. An example may be an application with highly algorithmic processing of a non-data base, traditional file, where many fourth-generation languages do not offer a distinct advantage.

It is clear then that production fourth-generation languages must offer substantial benefits of another kind. That difference is primarily seen in productivity improvements, which can be up to 10 times the speed of using Cobol for many applications.

The difference in productivity of production fourth-generation languages nver program generators is attributable to their higher level and/or less procedural language; a more streamlined interactive process from writing through execution; often, an interactive workstation development environment with a whole suite of development, editing, debugging and maintenance aids tailored to the language; and for some of the DBMS-linked fourth-generation languages, the exploitation of the power of the underlying DBMS.

### More advantages

Additional advantages have to do with the organization as a whole and its attitude toward DP. The introduction of such a language makes a statement about how MIS sees itself within the organization. DP moves away from a preoccupation with low-level procedurality to an emphasis on business problems. Important data management decisions can now be made in light of what is good for the organization as a whole, rather than what is necessary to meet narrow technical requirements.

From the point of view of departmental morale, the move to a fourth-generation language makes another significant statement: The department is a progressive one in which career development can take place at the forefront of commercial DP technology.

The message is clear: It is time to stop writing native Cobol. There has been and will continue to be a decreasing amount of new development in Cobol, with a resurgence of generator-supported Cobol. There will be a corresponding decrease in the maintenance of Cobol systems, with many being replaced by new systems written using fourth-generation languages. There will be an increase in the use of Cobol program generators for a decreasing segment of the development mix. End-user fourth-generation languages will continue to spread, but the biggest growth can be expected in the implementation of systems written using DBMS-based production application fourth-generation languages.

### In the future

There will be some move to extend the power of production application fourth-generation languages to end users. Because the interaction between end users and computers is very different from that of DP professionals and computers, there will most likely be forms- or menu-driven facilities for the less sophisticated user.

Future products will almost certainly include some hybrid that offers the benefits of both the fourth-generation language for development and the generator for production use. This will have the effect of keeping a user's options open at all times.

More attention will be paid to the front end of the design life cycle. There will be an increasing number of products addressing requirements definition, data base design, analysis and so on. Linked to the DBMS and the language or to the program generator, these hybrids could increase productivity by an order of magnitude.

Finally, the idea of the programmer workstation will become increasingly viable as more of these products become available on PCs. By offering identical functionality, these products will be able to exploit the desktop productivity of real-time response and will also add the benefit of off-loading CPU cycles. The use of a PC will serve to diminish partially the development productivity differences between fourth-generation languages and application generators.

These products are not far away. Certainly they will be in heavy use before Cobol is dead, and Cobol and fourth-generation languages can be expected to coexist for a good many years. The key to successful DP management has always been to take advantage of technological opportunity without locking into a dead-end product. The tonls are there for this approach with regard to development productivity.

*Rin is vice-president, Product Planning and Development, for Computer Corporation of America of Cambridge, Mass.*

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## SPECIAL SECTION: PRODUCTIVITY SOFTWARE

# Dealing With Data Control

DAVE RIDLEY

### ·BY·MICHAEL·D.·DEWID·

Fourth-generation language technology has gained industrywide recognition for savings in productivity and costs by providing reductions in coding, testing and maintenance of applications. Indeed, DP management views this tool as a revolutionary product that will eliminate the backlog of user application requests at a substantial savings to a company. However, this technology is not the miracle cure for all backlog woes and is in some cases creating unforseen problems for DP managers.

The major challenge management must overcome for the fourth-generation language to sustain its widespread acceptance is that of control; control of access, change, process and configuration must all be taken into account.

With the introduction of on-line programming, the amount of code a programmer can produce has been enhanced. Fourth-generation languages present the same benefit. As development activity increases, this process becomes more difficult to control. Managing development in today's sophisticated and diverse environments is impossible without automated methods.

Initially, control may not be a priority or even a concern to the prospective buyer of fourth-generation languages. The buyer may intend to use the language to model the design phase of product development. Control is not essential because the application will not enter the production environment. Although the objective of design improvement is of great value and may be the sole justification for purchasing the fourth-generation language, it most likely will be short-lived.

A top priority of the DP manager is to improve end-user satisfaction because if a user served by DP is pleased with the quality and timeliness of application development, then the DP department has bargaining chips for a bigger budget appropriation. Today, a firm cannot be competitive or even make daily business decisions without prompt and accurate processing of data. Eventually, the need to enhance service-level commitments or to minimize slipped project schedules and mounting application backlogs will compel management to place fourth-generation language code into the production environment.

The system development life cycle is by definition concerned with constructing efficient and stable application software. The application process starts with defining user requirements. Designing the application is next. Several levels of design detail are iterated until the user accepts the approach and sample outputs. Once the user endorses the conceptual approach, a project is initiated to allocate manpower and determine a schedule. Development personnel then begin translating the requirements and design documents into an application. The completed application passes through several levels of testing and is then put into production.

The development life cycle's primary purpose is to provide a level of control to prevent unauthorized or unexpected changes that impact other components of an application from being introduced into the production environment. The challenge of control is complicated because DP must manage hundreds of program components within hundreds of applications. Standards, conventions and access controls must also be introduced, further complicating the control issue.

With the advent of fourth-generation language applications, managers must apply the same level of discipline (control). The primary objective still is to minimize the risk of errors entering the production environment. In addition, there must be a means to track changes in programs to verify that only approved modifications are incorporated.

What to control becomes a crucial question. The vendor companies that developed program librarian software reported as early as 1969 that source code was the only important factor to control. Later, some vendors decided that the control of executable code was also important.

## SPECIAL SECTION: PRODUCTIVITY SOFTWARE

The issues involving what to control should not be dictated by aged librarian software. In fact, the librarians available today cannot manage components that should be controlled such as design documents, panel layouts, data base accessories, executable code for fourth-generation languages, code generators and other retrieval products. Anything short of controlling each and every item composing an application is inadequate control.

### The new discipline

Change management is vitally important for software development and maintenance. Changes made to source code, for example, can have far-reaching effects on a large number and wide variety of associated components such as object code, executables, job control language (JCL), procedures and documentation. As a programming system increases in size, the connections among its parts become more complex, and the need to control who makes what changes to what information grows accordingly.

Another area requiring control involves the management of all component interrelationships. It is essential to know exactly which components make up an application for a given release. Often, users track changes with burdensome paperwork and perform configuration management only with manual procedures. These methods are time consuming, inaccurate and ultimately unreliable. These problems can be resolved only with change and configuration control.

Data processing management must track changes to all types of information related to software development and production. Changes made in the host operating environment may occur, for example, through editing or linking. Change tracking requires records of who made changes, when they were made, exactly what changes were made, what names or labels were associated with the changes and even why the changes were made. By associating a change name with an individual component or even lines of code, management can obtain a complete audit trail for tracking a change request. This trail provides an invaluable cross-reference for tracking the impact of change across many applications and a record for program maintenance or reconstruction in case of errors.

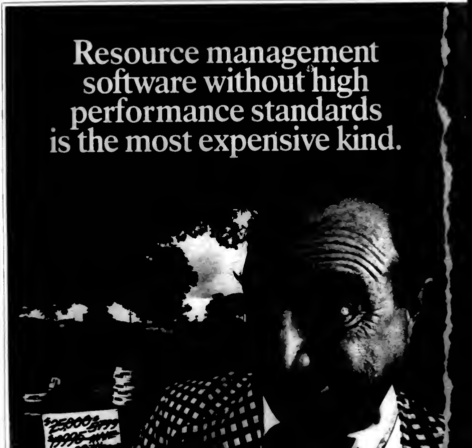
By storing only the exact changes in a given component from version to version, revisions of each information item become traceable while retaining efficient use of space. Furthermore, any previous versions of a component may be re-created on demand.

A configuration is a collection of all the related elements of an application such as requirements documents, source and object code, executables, JCL, data base accessories and any other related elements. Configuration management is defined as the organization and management of all components of an application as a single unit.

Configuration management provides several benefits for an organization. The automatic tracking of component dependencies eliminates the possibility of promoting either an application with missing components or one with incorrect component versions. The configuration management discipline guarantees the completeness and integrity of the production application. Moreover, the re-creation of an application in its entirety can easily be accomplished. In an accounting application, for example, the payroll system as of some previous date could be re-created with one command.

You do not have control over the development, maintenance or production environments unless each component can be protected or re-created on demand.

Whenever a particular release of an application is fixed — or frozen — its current components, each with its own change history, must be identified precisely. Thus, there are never any questions about which pieces of software belong to which release or which version of the corresponding documentation needs to be included with the software program. This is essential for performing maintenance on a failed application. With a control system in place, the development staff has


Resource management software without high performance standards is the most expensive kind.

no trouble identifying which component version needs repair.

When a particular release is frozen, it must be possible to derive from it a new configuration, with exactly the same structure and information, for continued modification or development. In this case, information must be shared between virtual copies to eliminate redundancy and reduce storage space.

Information sharing also permits development activities to occur along parallel paths. This flexibility is required to simultaneously support, for a given application, multiple development projects, emergency maintenance activities and quality assurance testing.

Configuration management procedures such as change tracking and status accounting must also be available. To enforce DP standards, configuration management procedures must be automated and take into account process control over the entire development life cycle. In addition, flexible reporting should be available, on demand, for project leaders, administrators, developers and auditors.

Change and configuration control allow management to track the development of any standard or nonstandard programs or elements as well as identify component interrelationships. Standard system protocols such as IBM Interactive System Productivity Facility can prevent users from avoiding the control required to maintain DP standards. Transparency can therefore be retained and productivity remains high.

The problems facing the control of the fourth-generation language are not new. Any solutions that have the potential to improve productivity dramatically will cause a loss of control. For example, from the early 1970s to early 1980s the report writer was a software solution to improve productivity. Like the fourth-generation language, report writer features such as reduced code and testing helped reduce the application backlog. The momentum gained in the development environment pushed report writing into the production application environment, where control problems arose. Most organizations that continue to support report writers in production today are unaware of how the report writers are evolving to new end-user specifications.

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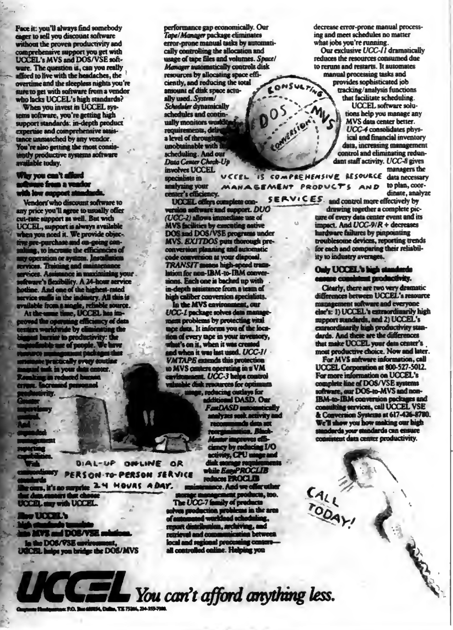
> *Control problems will continue until they can be solved by automated control methods.*

Control problems will continue to plague software production and development until they can be solved by automated control methods. For example, code generators now promoted for developing sophisticated hybrid systems and personal computer development workbenches offer further productivity increases. With these increases will come a corresponding loss of control. Now is the time to prepare to face this control loss. ◼

*DeWid is vice-president of marketing and the current head of IBM's marketing efforts for Softool Corp. of Goleta, Calif.*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## SPECIAL SECTION: PRODUCTIVITY SOFTWARE

# Selecting To Fit Your Needs

DAVE RIDLEY

### ·BY·JEFFREY·BERNKNOPF·

Increasingly, both end users and DP professionals are turning to fourth-generation languages as the answer to increasing productivity. But how do you determine which fourth-generation language product to choose? Your choice is limited by the environment (computer hardware and operating system software) chosen by your organization.

Every environment has advantages and disadvantages as well as a limited number of fourth-generation language tools available to assist you in your endeavors. The availability of fourth–generation languages for your environment and an understanding of the environmentally related issues is of fundamental importance in selecting the proper product.

During the feasibility phase of most DP projects, the hardware and software to be used is determined. Sometimes that involves introducing a fourth-generation language product where none existed previously or bringing in a second fourth-generation language that better meets the requirements of the project. In other cases, converting to a new operating system or purchasing a departmental processor for system development may be the answer.

End users who have budgetary control over projects can bring about similar changes, often relying on DP departments and information centers to make recommendations about their environment. Their primary consideration is ease of use.

End users are also very interested in personal computing. The PC revolution has put micros in most user departments and, in many cases, on each user's desk. Many fourth-generation language vendors have targeted their products at the PC environment. DP managers are only slowly beginning to appreciate the role of the PC in the application development process.

Environments range from the simple to the complex. The more complex the environment, the greater the need for products that are available in multiple environments. However, environmental availability is only the first issue that should be examined when selecting or using a fourth-generation language in your environment. Portability from environment to environment is a closely related issue. Other key product issues include efficiency, file type support, device support, vendor support and connectability.

When investigating portability, you must first consider the environment in which the fourth-generation language was developed. Many fourth-generation language vendors have concentrated on IBM operating environments for years and are branching out and moving into non-IBM environments today. Their expertise, philosophies and software experience are, therefore, oriented to IBM mainframes. Information Builders, Inc.'s product, Focus, is one example. Other products like Relational Technology, Inc.'s Ingres, have been available for some time on Digital Equipment Corp. machines and other hardware and have only recently been ported to IBM environments. Then there are products like Oracle Corp.'s Oracle and Pro Computer Sciences, Inc.'s Pro-IV that were designed with portability in mind.

The exact mechanism for transferring a product from environment to environment is also a concern. There are three basic strategies that relate to portability employed by vendors when designing their product:

- Coding the product "completely" in a portable language like C. Result: high portability.
- Coding most of the product (70% to 80%) in a fairly portable language like Fortran and developing the environment-specific components in assembler. Result: medium portability.
- Coding the product completely in assembler language for efficiency and completely rewriting the product for each new environment. Result: low portability.

There are various environments targeted by fourth-generation language vendors. No fourth-generation language operates in all environments. Very few of these languages even come close. Most products are designed to run in one environment, the one with which the product developers are familiar. In many cases that environment is IBM. Most fourth-generation languages that were not developed by the hardware vendor have a version that runs in at least one of the IBM environments.

### The selection process

The first step in selecting a fourth-generation language is to find one that operates in your company's environment(s). Next you must decide on the scope of projects to which your fourth-generation language will be applied. When selecting tools for end-user computing, products like Focus; D&B Computing Services, Inc. Nomad2; Martin Marietta Data Systems Ramis II; Oracle; Ingres; and IBM Application System are the tools to be considered. Most of these products are also applicable to complete application development, but they should be scrutinized — including benchmarks at size and performance characteristics of the application.

Products like Applied Data Research, Inc. Ideal; Cullinet Software, Inc. ADS/Online; Software AG of North America, Inc. Natural; Cincom Systems, Inc. Mantis; and Computer Corporation of America User Language provide complete application development facilities with products that are clearly oriented toward programmers and application developers. These products provide fast response times, high transaction rates, access to very large data bases and optimization for high performance. Each product is also closely tied to a high-performance data base management system, written in reentrant code, and to a teleprocessing monitor like CICS.

Project scope relates closely to efficiency. A frequent argument is that machines are becoming cheaper and user time should be optimized. While this is true, the argument is no comfort when your CPU is 100% utilized, there is no extra DASD and response time is two minutes. Fourth-generation language benchmarks are often the best way to assess efficiency, but very few benchmark results are available.

Inefficiency has always been a major problem with fourth generation languages. Fourth-generation language vendors expend a great deal of time, effort, research and money on this issue. In the IBM world, efficiency translates in such areas as the following:

- Reentrancy. A reentrant product provides one copy of the product to all users. This saves on disk I/O, virtual paging and user region size (memory). Of the end-user, fourth-generation languages, only Nomad2 is fully reentrant.
- Optimized I/O. Accomplished by techniques such as rewriting the low-level EXCP routines, automatically recognizing the difference between sequential and random access, and a B-Tree index to provide rapid random access.
- High-performance sorts. Often required for queries and reports.
- Minimizing the instruction path length, which is the number of instruction required to turn fourth-generation code into machine language.

Other criteria for evaluating fourth-generation languages is device support and file type support. IBM products should support the features of a 3270-type terminals like the IBM 3179 and 3279 as well as terminals that are wider (greater than 80 columns) and deeper (more than 24 rows). File type support is even more critical. To maximize flexibility, a product should be able to read a standard IBM access method file, a data base file from another product or a nonstandard file.

### For the BUNCH

Fourth-generation languages in BUNCH company environments are few, which leaves users with a limited choice. From a fourth-generation language view, Honeywell, Inc. is the most popular of the BUNCH, with the widest variety of proucts. On Burroughs Corp. and Sperry Corp. machines, almost the only product available is provided by the hardware vendor. No fourth-generation languages are available for the Control Data Corp. Cybers or the NCR Corp. V-8600 series mainframes when running their native operating systems. Several products like Ingres can be run on these machines when the Unix operating system is chosen. However, both Oracle and Pro-IV are available on the NCR Tower minicomputer running Unix.

Several fourth-generation languages are available for Honeywell's DPS series with its GCOS operating system. Both the environmental champs, Oracle and Pro-IV as well as a version of Mantis and Henco Software, Inc.'s Info, can be found in this environment. In addition, Honeywell recently introduced its own fourth-generation language, the Integrated Query System (IQS), which includes features like relational file access, rapid application development, report and query from existing or IQS files and a front-end menu system.

Burroughs has developed its own product, Linc II, which runs on all of Burroughs' major computers and is well integrated with its DMS II data base software program.

Linc II is oriented toward applications development and was designed as a replacement for Cobol development. The product provides a comprehensive set of nonprocedural functions that include a menu-assisted application development process, report and screen painting capabilities, integration with a data dictionary and generation of on-line documentation. The creation of a data base is relatively simple as is the process for generating queries. All functions of this fourth-generation language, including application generation and network

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definition, are available from the main Linc II Activities Menu. No other fourth-generation languages are available on Burroughs machines.

Sperry has targeted its product, Mapper, for the end-user audience. Mapper provides a set of functions that allows for the rapid development of reports through a variety of nonprocedural functions. Good integration is provided with graphics, allowing data to be plotted on a UTS 60 color graphics terminal in the form of high-resolution pie charts, bar charts and so on. Mapper contains its own data base system that is built around a file cabinet approach. Interfaces are also provided to word processing and office automation functions, financial modeling and to the PC. A Help facility and tutorial are also provided with the product. Oracle is the only other fourth-generation language product that is available on the Sperry 1100 series machines.

The most popular mini targeted by fourth-generation language vendors is the DEC VAX environment. DEC is the second largest hardware vendor and, with recent expansions in the 8600 series of the VAX line, provides a variety of processing capability. Throw in the Microvax II and you can develop systems for three to five people just as easily as you can for 70 to 80 people. With the VAX cluster concept, additional processing power can be added as needed.

Adapting and executing in a VAX/VMS environment is very different from an IBM mainframe. In many cases, end users or departmental development groups have purchased the VAX because they want to move away from the centralized IBM environment in which they had low priority and poor response times. Adapting means supporting a VT100, VT200 or VT220; it also means optimizing packets when integrating systems through Decnet. Because the DEC unit works with character I/O and the operating system sees and echoes back each character, a product must be very conservative with terminal I/O. File type support is also important.

In looking at minicomputers, you find the same fourth-generation language vendors. For the Prime Computer, Inc. Series 50 machines running the Primos operating system, there are versions of Ingres, Oracle, Pro-IV and SAS Institue, Inc. SAS. The same set of products, except Pro-IV, is available on the Data General Corp. MV series machines under the AOS operating system. On the AT&T 3B line running Unix, only Ingres, Oracle and Pro-IV are available. A version of Focus will soon be released for the 3B machines.

Another minicomputer in wide use is the IBM System/36. To date, however, only one fourth-generation product, Pro-IV, is available for this machine. Most vendors have taken a wait-and-see attitutde as IBM continues to evolve its minicomputer strategy.

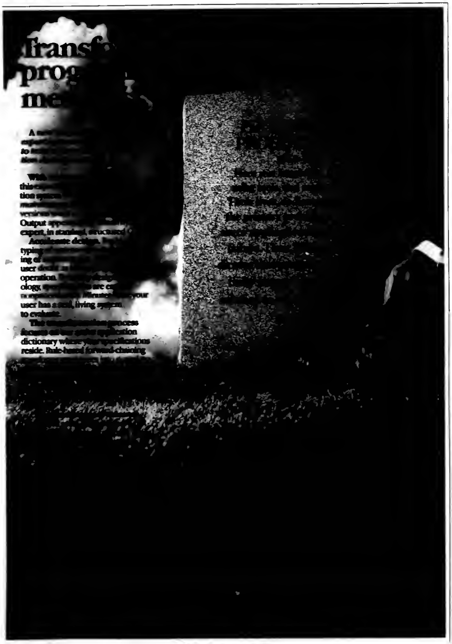
Fourth-generation language vendors, when faced with the issue of supporting PCs, have three basic routes to choose from: develop a complete PC version; provide integration through micro-to-mainframe communications, mostly with upload and downloads; and run the IBM CMS version of their product on the IBM Personal Computer XT or Personal Computer AT/370. This last alternative is very limiting because few XT/ or AT/370s are installed in corporate America. Similarly, a micro-to-mainframe solution is limiting because you cannot perform stand-alone application development with a familiar tool (the mainframe product) and application prototyping and development of mainframe systems.

Developing a complete PC version is a tremendous undertaking. Thus far, only Focus, Oracle and Pro-IV have PC versions that contain most of their mainframe features.

To a much more limited extend, SAS and Ramis II have PC versions of portions of their product available.

Personal computer versions of Applied Data Research, Inc. ADR/Datacom/DB with Ideal and Nomad2 are currently under development. ■

*Bernknopf is president of New York-based Fourgen Information Systems, a consulting firm specializing in fourth-generation language technologies.*



CIRCLE READER SERVICE NUMBER 211

**SPECIAL SECTION:**
**PRODUCTIVITY SOFTWARE**

# Performance Benchmarks For 4GLs

**By Al Hendrickson**

The label "fourth-generation language" is applied to a wide variety of products, and any benchmark program that attempts to compare the performance of one product with another must take into account the differences in the nature of each product.

DAVE RIDLEY

Obviously, the types of programs that are used to test the performance of third-generation language products cannot validly be applied to fourth-generation language offerings. Fourth-generation languages were not created with general-purpose programming in mind. The benchmark programs used to test a fourth-generation language must be oriented toward generic functions. These tests can be put into the following five general categories:

- Data definition and data base administration functions through the data dictionary.
- On-line input and validation of data.
- Ad-hoc query processing.
- Production reports.
- Transaction processing functions.

The best type of benchmark is one that incorporates these five functional areas in a simulated application environment. That is, instead of testing individual features of the language, it defines a reasonably complex application requirement and processes a standard set of data through the application.

It is very important that the benchmark specifications allow flexibility in application design. The program designer must be able to prepare a solution that matches the characteristics and capabilities of the product and must not be constrained by physical appearances such as screen layout and report format. The design of the data files to be used should be left to the program designer.

On the other hand, the benchmark specifications should represent a standard set of transactions and information requirements. The specifications should include realistic data. This means some of the data should be incorrect, and corrections and Help requests should be included in it. All tests should involve simultaneous access to multiple files.

The standard used to measure performance should be throughput (characters or transactions per minute), and measurement should be done in a multiuser test environment. Stand-alone measures of CPU usage do not account for the capabilities of overhead activities such as terminal management and concurrency controls.

A good benchmark test for a fourth-generation language would be to define a set of requirements for an application. The benchmark specs would include a set of customers, inventory items, orders and payments for the program to process as well as a set of standard reports such as sales reports. The specifications should also include one or more bulk processing requests. A selection of queries on the data such as "Who has bought product X?" should also be defined.

Ideally, people experienced with each product would prepare a solution to the benchmark application requirement and then measure throughput for the orders, standard reports and other benchmark functions. It is important that the people writing the programs understand how to use their fourth-generation language because the benchmarking tests capabilities of the programmer, not the product.

The most important considerations in benchmarking a fourth-generation language are the following:

- That the benchmark be oriented toward a typical application of the product and that the designer be given sufficient freedom to prepare a solution that meets the requirements within the philosophy of the product.
- That the test be oriented toward measuring throughput of a standard set of data and processing requests.
- That the benchmark requirements are complex enough to represent a typical application — including multiple users, multiple files, data errors, corrections and so on.
- That the people preparing the programs to be used are experienced with the product and understand how to optimize data file design and application programs.

*Hendrickson is manager, product specialist services, at Cognos, Inc. in Ottawa. His chief area of specialty lies in fourth-generation language development methodology.*

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CIRCLE READER SERVICE NUMBER 214

# Taking Account Of Big 8 Software

### BY STAN KOLODZIEJ

The Big Eight accounting firms have cultivated a certain serious demeanor when it comes to business. It goes with the territory; auditing and tax work do not easily lend themselves to splashy advertisement.

While the Big Eight firms are low key about their bread-and-butter work, they are beginning to come out of the closet about their fast-growth track in computer software and services. Companies such as Arthur Andersen & Co., Price Waterhouse & Co., Arthur Young & Co. and Ernst & Whinney are aggressively working in-house and with top-notch software houses to churn out everything from micro-to-mainframe packages for auditing, tax and general accounting to expert systems and information systems project planning tools that use the latest artificial intelligence techniques the firms have mustered from academic research.

The Big Eight are heading directly for MIS and pitching themselves as complete systems vendors. Their consulting services are branching out into current hot industries: manufacturing, distribution and applications development. Their auditing and tax divisions are beating a path to MIS too, consolidating their marketing thrusts on systems people, realizing that the MIS purchasing reach is extending corporatewide.

If possible, the Big Eight firms are trying to be discreet about all the activity for good reason. Just a few years ago, Arlington, Va.-based ADAPSO, Inc. put a scare into the Big Eight by screaming conflict of interest and threatening legal action if the firms persisted in supplying software to clients they were auditing. Though the threat of legal action has subsided, ADAPSO's position has not changed. "We still think that firms doing auditing for clients they have also installed software for will not have the same objectivity about their own systems," said Dave Sturtevant, ADAPSO's vice-president of Public Communications.

Allen Phelps, national director of Computer Advisory Services at Touche Ross & Co., New York, disagreed. He said that people at his firm audit Touche Ross' installed client systems with the same diligence as they would any other. "If you don't, it'll eventually backfire and come out in the wash. You could lose a lot of clients that way."

Outsiders are also divided on the issue. "The ADAPSO people are the ones complaining, not the Big Eight customers," claimed Paul Cubbage, senior industry analyst at Dataquest, Inc. "Providing software is a good way for them [the Big Eight] to smooth out the ups and downs of a volatile consulting field."

Another analyst, who wished to remain anonymous because of his extensive work for Big Eight clients, explained that because of the intense competition among the accounting firms and the finite number of clients, the Big Eight firms have, by necessity, stepped up their push to develop systems and micro software to offset shrinking sales margins. "There are only so many companies to be audited," the analyst said, "so the [Big Eight] firms have to push their computer consulting services. You have to look at it historically. There is a potentially enormous market opening up. In the past, most divisions of large corporations have resorted to consultants. Marketing people use consultants. Financial people use consultants. Everyone has used consultants except MIS, but that's changing. MIS can't cope with the applications backlog anymore. They're under too much pressure to get everything in gear. Now more often than not, the consultants they turn to [in order] to revamp their old Cobol and Fortran systems and help plan future MIS projects are from the same company doing their auditing and taxes," the analyst concluded.

In light of these market conditions and the financial and lobbying clout of the Big Eight accounting firms, ADAPSO has confined itself in recent years to holding meetings with members from the Big Eight firms to try and blunt some of the Big Eight's incursion into their business, but they are in a lame-duck position.

"They [ADAPSO] don't understand auditing, and that's what this whole thing revolves around," said Ed Pringle, national director of Management Consulting Services at Coopers & Lybrand, Floral Park, N.Y. "It's funny. We've found a lot of common ground with ADAPSO in the past on issues such as protection of software and the development of international business. On this point, however, we're at loggerheads. They haven't rescinded their position, and that's a sore point with us."

As the Big Eight consulting services have grown enormously over the years, the companies have become adept at producing software for their own internal purposes and spinning it off for their clients. In the past this has stemmed from the auditing and tax divisions, but lately, the brunt of Big Eight software has come from consulting divisions, and little of this business concerns the traditional accounting breadwinners. A firm like Cleveland's Ernst & Whinney can go to a client and present something called Concept 2000, which is the firm's answer to a client's systems development problems.

Combining in-house engineering software with systems from Spectrum International, Inc. and Nastec Corp., Ernst & Whinney consultants are in a position to carry systems development life cycles from the planning stages through to the maintenance of major applications. "What we've developed are automated tools that help our consultants go in and develop systems," said Marc Moresky, director of the Implementation Management Group at Ernst & Whinney.

"Over the years these methodologies have been honed so that we can offer them to clients as a packaged part of our service. Basically, we have the resources to cover the board. If the client wants an outside development system installed, we can do it and customize. If he wants to plug in some outside packages, we can do it. It can be financial, manufacturing or office automation," Moresky explained.

What Moresky also made clear is Ernst & Whinney's positioning of its software as a bundled part of its consulting billiogs. "The software we produce in-house is not sold separately or prepackaged. It's priced into our consulting services. We don't want to compete head to head with Ashton-Tate and Lotus Development Corp."

Ernst & Whinney is not alone. Other Big Eight firms are careful in how they are perceived as software suppliers in the marketplace. As primarily financial software suppliers, the Big Eight firms concentrate on producing vertical application packages, many dealing with esoteric niches such as international tax. They scrupulously stay clear of general micro packages such as spreadsheets and word processors, where the margins on single and group sales are low. The vertical applications are instead bundled into mainframe systems where the margins on such sales can be lengthened by burying them into the broader context of larger systems and service billings.

"The Big Eight firms can get clever in the way they charge for their services," said Damian Rinaldi, director of Software Research programs at International Data Corp. (IDC) in Framingham, Mass. "They can price with much more leeway."

That is also one reason it is difficult to get anywhere near

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## MARKET STRATEGIES

exact figures for Big Eight software sales. Al Crossman, associate director of applications at Arthur Andersen of Chicago, said the company's design and installation services amounted to $40 million in 1985. "That included consulting and software leasing fees," he explained. Hardly a breakout of software details, but other Big Eight firms are even more equivocal."

"You can make a quick rule of thumb by attributing $100,000 in sales to each consultant in Arthur Andersen's consulting group," claimed George Colony, president of Forrester Research, Inc., Cambridge, Mass. "You can't get exact software figures."

IDC's Rinaldi said his group stopped trying to research Big Eight revenues at the end of 1985. "They're tight lipped," he concluded.

Of all the Big Eight firms, Arthur Andersen is the most aggressive in expanding software sales outside its traditional client bases. It is also probably the most aggressive in promoting its software. Arthur Andersen advertises in target-specific trade journals to promote its Mac Pac series of manufacturing software, its Distribution Control System and various accounting packages, and it has initiated joint development deals with high-profile mainframe software vendors such as Management Science America, Inc. and McCormack & Dodge Corp. Others, such as Ernst & Whinney; Price Waterhouse; Arthur Young; and Peat, Marwick, Mitchell & Co., are targeting focused publications and trying to arrive at joint marketing and research agreements with outside firms like James Martin Associates.

The gray exterior of some of the Big Eight firms hides a flurry of computer research activity in which they are now getting involved. These firms are using their beefed-up computer consulting expertise to research leading-edge technologies, and some of this research promises to have an impact on the way corporate America perceives and handles its data processing.

Arthur Young is a good example. The company has designated artificial intelligence — and more specifically AI's subset, expert systems — as one of its big commercial software growth areas. Arthur Young has been working with several research groups at MIT in Cambridge, Mass., to develop a series of expert systems software for current overriding concerns such as the impact of micros on corporations, group decision making, the managing of corporate experts, expert systems in information sharing and application management.

Some of the five-year projects that come under the umbrella name of "The 1990s" have been under way at MIT for a few years. John Sifonis, Arthur Young's national director of Information Technology Consulting in the Information Technology Group, explained that the company hopes a number of expert systems applications will result from the venture to be supplied to future clients over a period of several years. "We've classified these projects as fifth-generation applications that will be taken to clients and marketed as strategic tools that will make a company more competitive. Their ideal use would be to develop strategic corporate plans for information systems."

Sifonis said one such expert system is being fine-tuned by Arthur Young and Central and South West Service, Inc., a Dallas-based utilities holding company and client of Arthur Young. The system, which has no formal commercial name as yet (though Sifonis said it is slated to be available this fall), is being used to estimate and plan applications development for MIS.

"A planning manager in MIS can typically get 600 requests for applications from end users," Sifonis explained. "Managers will have a set of project planning questions that end users would have to fill out, such as, 'What are the end-user functions?'; 'What sort of impact would the application have on the user, the department and possibly the rest of the organization?'; 'Costs?'; 'Is it on-line [or] batch?' The answers would go to MIS, and there they would be prioritized.

"What we've done with the expert system is taken the questionnaire concept and many of the relevant questions and built an expert systems shell around it. The system prompts the end user through the exercise and then evaluates the information.

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making suggestions and surfacing what it thinks are the important facets of the application to the user and organization."

Sounds impressive, but Mike Intille, Central & South West's vice-president of information services, said there are bumps to iron out of the system. "The question parameters were taken from research at Harvard [University], but the primary, initial problem with the system concerned the need for the end user to answer all the questions before the system would begin to evaluate," Intille said. "That's been resolved. We pared down the number of questions from about 200 to the important 20. We looked at some commercial MIS estimating packages, but this is closer to the artificial intelligence we wanted."

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> *Some Big Eight are serving notice they will not be left out of future computing.*

The system is micro based, running on IBM PCs and PC ATs, but it can also run on the mainframe, accessed by terminals. "I imagine there are a lot of companies in the same position we were," Intille explained. "Just a few years ago we had some PCs, and there was still a select set of users we were in constant contact with. Then we brought in 750 PCs, extended distributed processing, became geographically dispersed, and that same contact became impossible. We hope this system can extend the arm of MIS and help us keep in touch with end users. The whole thing is to make us more productive."

Big Eight accounting on the leading edge of corporate AI? Maybe not, but other Big Eight companies are not standing still. Price Waterhouse is developing expert systems in-house with an aim to spin them off to clients. Mike Bealmer, national director of Systems Development Consulting at Coopers & Lybrand, said his company is producing claims adjustment expert systems for insurance companies and universities while working on tax expert systems for the Coopers & Lybrand staff. Peat Marwick and Ernst & Whinney are also involved in knowledge-based systems. The Big Eight firms are not making a big industry splash, but for those who listen, they are quietly serving notice that they will not be left out of being a big part of future computing.

Not all the Big Eight are serving notice, however. Companies such as Coopers & Lybrand and Deloitte, Haskins and Sells state bluntly they have little intention of becoming forces in supplying homegrown software for clients or, for that matter, aggressively selling software from third parties. "We're just not fast off the dime for marketing third-party software," Coopers & Lybrand's Pringle said. "We're not a marketing organization and don't intend to be. We'll stay with our strengths."

One analyst who said he has followed the Big Eight for some time explained that when he first started he thought the Big Eight firms were all the same. "Now I know they can be slotted into three categories. Arthur Andersen is in a bracket by itself, the most aggressive in computer consulting and the most onerous, if you like, in its courting of clients it audits. There is a middle slot of companies that might be evasive about what they do, getting into gray areas of ethics. The third group won't offer products or recommend other products for clients they audit."

Still, with competition heating up among the Big Eight computer consulting services, it can be expected that tact among the Big Eight will slip. When Microage, a Tempe, Ariz.-based computer retailer, searched for a new distribution control system recently, Price Waterhouse, Microage's auditor, tried to dissuade it from using what Microage thought was the best system it could find on the market. The system just happened to be from Arthur Andersen. F

*Kolodziej is a senior writer at* Computerworld Focus.

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## TECHNOLOGY INSIGHT

# Examining Expert Systems

*An expert system attempts to represent and use knowledge in the same way a human expert represents and uses knowledge.*

### • BY • JOHN • B. • LANDRY •

Expert systems is the newest buzzword in data processing organizations worldwide. Artificial intelligence technology, on which expert systems is based, is perceived as new in DP circles, though it has been in development at Stanford University, MIT and Carnegie-Mellon University for nearly 15 years. Until recently, its evolution within the academic environment has created the impression that AI and its various branches remain of limited use to the commercial world.

Besides expert systems, other branches of AI include disparate technologies such as natural language processing, machine vision and robotics. Each of these deal with machine emulation of human senses — seeing, hearing and touching. Expert systems go one step further and address another human trait — thinking. An expert system attempts to represent and use knowledge in the same way a human expert represents and uses knowledge.

Specifically, an expert system is a computer software system that acts as a consultant in decision making. The system contains information on a particular subject in the form of a knowledge base. The representation of this knowledge is in the form of if-then rules, or production rules. A reusable program, called an inference engine, permits the system to apply a knowledge base to a particular problem. The problem is usually discussed with the user in an interactive session, or consultation.

Expert systems technology is appropriate for applications that resist conventional algorithmic solutions, for problem areas that change rapidly and for problems that are now laboriously and expensively solved by human experts. The technology differs from conventional programming in many ways but most notably in its ability to react to change. In a conventional language, the order of instructions is critical. By adding or deleting code to an existing program, an error in the location of the change can modify the entire program to yield the wrong result.

In a rule-based expert system, rules can generally be grouped in any order because execution is controlled by the inference engine, not by the order of statements. An expert system is driven by the data being entered during the consultation, not by the sequence of production rules. This not only makes the program more readable but, more important, makes maintenance easier.

Expert systems got their start in the early 1970s. The most well known of the expert systems developed at the time was Mycin, a Stanford-developed system dedicated to diagnosing blood infections. Mycin represented the knowledge of physicians who were experts in blood infections, and it provided the ability for other physicians to consult with the experts, aiding in the diagnosis of blood infections and even recommending treatment.

Mycin illustrates some common features of early expert systems. The early systems tended to represent the knowledge of experts in the true sense of the word, that is, doctors and others practicing within narrowly defined domains of knowledge. At first, early forms of these systems did not separate the knowledge base from the inference process. However, these two components were separated in subsequent releases, most notably in the form of Empty Mycin, or Emycin, which separates the knowledge base containing rules about blood infections from the inference engine. This breakthrough allowed Mycin's inference engine to be used with other knowledge bases, thus introducing the concept of an expert system shell.

This separation of inference engine from knowledge base provided the conceptual foundation for the commercially available expert system builders that have recently

been introduced. Many AI researchers have formed corporations to exploit their knowledge of this technology and provide it to the corporate environment. Product introductions include M1 and S1 from Teknowledge, Inc., Knowledge Engineering Environment from Intellicorp and Automated Reasoning Tool from Inference Corp.

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> *Most commercially available shells operate on personal computers or on a variety of very expensive, single-user AI workstation products.*

These shells, however, are not well integrated into the commercial DP environment, from either a hardware or software point of view. Most of the commercially available shells operate on either personal computers, which typically run out of gas in systems exceeding 100 rules, or on a variety of very expensive, single-user AI workstation products from vendors such as Symbolics, Inc., Xerox Corp. and Digital Equipment Corp. Furthermore, most are written in Lisp, a language not well understood in commercial DP and historically considered to provide inadequate performance for multiple-user commercial work. Typically, these products cannot access commercial data bases and are not accessible to the large user community already connected to central-site mainframes or minicomputers.

Therefore, the use of expert systems is severely constrained by the hardware/software platforms that current technology provides. Admittedly, some vendors have responded. IBM introduced its own expert system product last year, accessible in either MVS or VM, but it provides no hooks to the data base management system and is not callable from higher level programs. Symbolics has announced an IBM Systems Network Architecture gateway product, connecting its machine to the mainframe, but this clearly does not open Symbolics-based expert systems to the masses.

As a result, expert systems technology applies to only small and isolated applications, domains suitable to dedicated machine processing. Use requires people trained in specialized languages such as Lisp or Prolog, forcing a second and potentially elitist programming staff. Purchase of dedicated and expensive hardware is required. Without access to the corporate DBMS, it forces data to be duplicated and imbedded within the knowledge base — a well-known no-no in commercial DP. Because data from the outside world is supplied exclusively via a consultation Q-and-A with the user, applicable problem areas are further narrowed.

### A different scenario

If expert systems technology is to be successful in the commercial environment, it must overcome the limitations described above. Beyond that, however, this technology can be most effectively used in commercial DP by imbedding expert components in industrial-strength applications software.

The examples of early expert systems illustrate how expert systems emulate human experts, normally in narrowly defined domains of knowledge. What has remained unrecognized, however, is that multiple experts can be found in even the most typical commercial DP applications.

Take order processing. Order processing systems are complex, typically requiring frequent and expensive maintenance. In corporate environments, new marketing campaigns can affect components of the system, particularly the part of the system that deals with pricing orders. Seasonal promotions on certain products can frequently wreak havoc on the pricing code, code that is so fragile from frequent maintenance that it is already in danger of breaking.

Yet pricing is an expert function. There are experts in the organization who have developed the "rules" for pricing, but, historically, commercial DP has chosen to represent those rules as algorithms. However, it is preferable to represent rules as rules and to rely on an inference process to determine when to "fire" the appropriate rules when called upon to do so. By allowing the on-line or even the batch order processing system to call the inference engine when required and to provide the inference engine with direct access to the corporate DBMS, you can imbed this expert component within an application.

Within this single application are many other expert components such as an order hold expert (What are the rules for putting orders on hold?), an inventory allocation expert (What are the rules to allocate inventory if we are running out of goods?), an order sourcing expert (What are the rules regarding substituting items and shipping from alternate warehouses?), a carrier selection expert (What are the rules for selecting the most appropriate transportation?) and so on.

The above components illustrate the expert metaphor. You can visualize the presence of a human expert making the decisions in each of the problem domains

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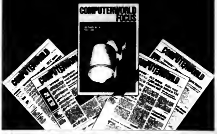
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described. In fact, the expert components often exist in the commercial applications software areas found most difficult to parameterize and most likely to be maintained.

Imbedding the expert components in an application represents a new architecture for large-scale application software. Developed in this manner, the application becomes a superstructure of programs atop a host of expert components. This new development environment compares favorably against the criteria used to describe an ideal development environment.

Rules are excellent communicatioo vehicles; they eliminate the confusion that develops between analyst and user in describing the problem. Their English-like language is far less intimidating to a user than structure charts and pseudocode. The rules specification actually represents the system itself; no further translation to design spec and then to programming is required. This situation results in less cost because the analyst actually builds the system and eliminates the risk of things being lost in translation.

The interactive consultation environment can be used to validate the system before it is imbedded in the production application. This environment strongly supports prototyping, acknowledged to be the best method of ensuring that the system fulfills the user's requirements.

Finally, this type of system can be highly portable across machine size and manufacturer boundaries. Because the knowledge base is merely data, all that is required to move the system to another environment is the porting of the inference engine.

### Input and output

The discussion thus far has been limited to applying expert systems technology to the processing components of applications systems. This technology also has uses in the two bookends that border process: input and output.

Let's look at input, or data-entry. Nearly all on-line commercial applications use a forms-based metaphor as the vehicle to communicate between system and user. A form (for example, an order form) is presented on the screen and the user fills it in and presses Enter. The system accepts the transaction or issues an error message indicating some validation edit was violated. The user corrects the error and the process is repeated. On forms that are frequently utilized, a user gradually becomes aware of a system's sensitivities and encounters fewer errors.

The problem is that the 80/20 rule applies to the number and frequency of use of forms in the system. That is, 20% of the forms are used 80% of the time. The forms used less frequently usually involve maintenance of system parameters or master files. Because they are used infrequently, users normally turn to the documentation and guess their way through.

What does this have to do with expert systems? Plenty. The forms metaphor works best with those transactions that were originally paper, that is, orders, invoices and journals. However, infrequent transactions might best be entered by the user engaging in an interactive Q-and-A session with the system, the very method an expert system shell provides in a consultation. Furthermore, an expert system consultation does not ask any questions deemed irrelevant based on its analysis of responses to previous questions.

In this way, the application uses itself as the expert, guiding the user through the dialogue and asking only the questions relevant to type of transaction being entered. As is typical in expert systems, the user can inquire why the system is asking a question or ask for help, providing on-line documentation precisely at the point it is required. Successful termination of the consultation can cause the appropriate record to be added or updated.

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> *Further enhancements to expert systems technology will lead to fifth-generation application development tools to be used in building intelligent production applications.*

Imbedded expert components can similarly augment information output applications. By combining these components with report writers, for example, experts can be employed to analyze report information in ways historically considered impossible.

Expert systems technology is not a stand-alone discipline nor does it reside exclusively in the domain of pure research. Knowledge-based technology can immediately be imbedded in today's traditional commercial applications. Further enhancements will lead to the creation of fifth-generation application development tools to be used in building intelligent production applications. Expert systems can provide a degree of flexibility in the definition and execution of real-world applications never before possible.

*Landry is choirman of the board of Distribution Management Systems, Inc., a distribution logistics and warehouse management software systems vendor located in Lexington, Mass.*

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## TECHNOLOGY INSIGHTS

# Building The Best Data Base

### • BY • WILLIAM • INMON •

All too often, the basic technology needs of users can change by the time products come to market. This can leave designers in a reactive stance, trying to explain why yesterday's notions don't fit today's needs.

Consider the concept of what a data base is supposed to be and how the concept has changed over time. It is likely there are many practitioners and theoreticians who would agree with the following rough definition of a data base: A data base is a nonredundant collection of data relating to a major subject relevant to the enterprise. However, this notion of a data base is dated and does not apply to much of the data base processing (especially decision support and end-user computing) that is occurring in the mid-1980s. The concept of what a data base is in the 1980s may not have changed in theory but has changed in practice.

Much of the discrepancy between practice and theory has to do with the issue of redundancy of data.

Two salient points should be made about the definition of what a data base is as previously defined — a data base is organized around the major "subjects" of the enterprise, and the data in a data base is nonredundant. Consider the origin of these two concepts. Prior to the data base idea there were master files associated with an application and, at least initially, were almost exclusively run on a magnetic tape file media. Over time, as the processing needs of the enterprise grew, the increasing number of application-oriented master files proved to be awkward and intractable primarily because of the large amount of redundancy of data across all the many master files.

By organizing data around subjects rather than individual applications, the redundancy of data that related to the subject was reduced or exhausted entirely.

In response to the shortcomings of master files — which were initially on a sequential media such as magnetic tape and in later years on direct access storage devices used as a replacement for magnetic tape — the concept of data base with a nonredundant subject orientation arose. At this point in the evolution of data base there were few choices of data base management systems (DBMS) — historically, IBM's IMS; Cincom System, Inc.'s Total; Software AG of North America, Inc.'s Adabas; and MRI Systems Corp.'s System 2000. Furthermore, these early software packages had to satisfy all needs for data base processing, which fit well with the then-current notion of data bases being filled with nonredundant and subject-oriented data.

But the volume and diversity of demands for DBMS processing and the data bases controlled under the DBMS soon outgrew the capabilities of the existing software. In particular, the demands for the ability to manage large volumes of data, a high degree of on-line availability, consistently fast on-line response, access to data at a detailed level, access to data at a summary level and rapid development and change of systems stretched existing software to its limit. A new type of software sprang up. Easy-to-use, fourth-generation languages (such as Information Builders, Inc.'s Focus; Martin Marietta Data Systems' Ramis II; D&B Computing, Inc.'s Nomad2) addressed a need that the then-existing DBMS software did not adequately address — the need for decision support systems (DSS). Existing DBMS software at that time had its hands full addressing the issues of performance and availability.

Almost imperceptibly, the concept of what a data base is changed as the fourth-generation languages began to enjoy widespread use. The advent of fourth-generation languages signaled the end of nonredundancy of data. With the powerful language constructs under fourth-generation languages, a single repository of data to serve all needs was unworkable for performance reasons alone. In addition to the power of the language, users of fourth-generation languages demanded autonomy of processing and took their data to separate, private processors such as PCs or individual address space on a time-sharing processor.

### A changing notion

With the end user's autonomy of processing, the concept of the data base was extended beyond the notion of nonredundancy of data. Autonomy of processing by the end user and nonredundancy of data are mutually exclusive and will remain that way. The source of the data serving the many end users is the production data serving the day-to-day operational needs of the organization. The service relationship between the two types of data — production (or operations) and end-user, DDS data — was made by an extract process (sometimes called a snapshot, download or a strip) in which operational data was scanned and selected records were sent to the end user.

The extension of the data base concept to include data that serves both end user and production was termed the dual data base concept, where one data base served high-performance production needs and the other served end-user DSS, fourth-generation language needs (hence the name dual data base).

As originally evolved, a dual data base strategy implied a dual DBMS strategy as well because the historical perspective of most DBMS software packages has been polarized to the point that the DBMS meets either high-performance production needs or DSS needs, but not both. But at least in theory, a dual-DBMS strategy is not necessary even in the face of dual data base.

Consider a "modern" software DBMS package like Applied Data Research, Inc.'s ADR/Datacom/DB and its associated software. Using the same data base technology, the product can access data across a network of large processors. ADR/Datacom/DB can access data across different size processors as well, all under the control of the same dictionary. The tool can access data either a set at a time or a record at a time, allowing the user to utilize the software as a high-performance tool or use it in a fourth-generation language mode. As a result, ADR/Datacom/DB is an example nf a single software package that can handle redundant (that is, production and end-user) data, proving that dual data base does not necessarily imply dual DBMS.

But the evolution from master files to the single, nonredundant, subject-oriented data base to the dual data base approach only leads to the recognition of a more fundamental division of data — the division between primitive and derived data.

Primitive data measures or describes a single event for a single customer of the enterprise. Derived data measures or describes the activities of either multiple events and/or customers of the enterprise. In general, primitive data is the source for derived data. Classically, production data is composed mostly of primitive data, DSS data is composed mostly of derived data. The split then in the concept of data base caused by the advent of fourth-generation languages is natural and leads to the more fundamental split between primitive and derived data. In other words, early notions of the data base referred only to primitive data.

In fact, the very nature of derived data is one of redundancy. Suppose a bank wants to determine the average savings account balance and the number of monthly deposits for all accounts with a balance greater than $5,000 as of Jan. 1. At a primitive, detailed level there will exist many accounts with balances greater than $5,000 on the specified date. Each of these accounts will enter into the calculation of the averge balance and the number of monthly deposits. The final derived data — average balance and number of deposits — will indirectly reflect many detailed, primitive occurrences of data.

Even though the derived data is a single element or occurrence of data, it is formed from multiple occurrences of primitive data, and in that regard, primitive data is redundantly represented in the individual, primitive occurrence of data and cumulatively in the derived data.

Viewed from the perspective of the differences between primitive and derived data, the evolution of the concept of the data base makes sense. Without the perspective of primitive and derived data, the progression of what a data base is in practice has so many anomalies as not to make sense.

### Old problems, new flavor

With dual data base and the deliberate split of primitive and derived data come some old problems with a new flavor. Whenever there is redundancy of data, as there necessarily is in the end-user DSS environment, the question of consistency and accuracy of data arises. However, the problems of redundancy of data in the dual data base DSS are very different from the problems of redundancy as were experienced in the earlier single data base environment (or truth data base environment, as it is sometimes called) because of the following:

- *In the truth data base environment* primitive data was stored at a detailed level and was used to service customers' day-to-day operational needs. Using the bank example, when a customer's balance was $100 in one file and $500 in another, either the customer or the enterprise was in for a rude shock. But in the DSS environment, derived data is not used the same way and there is a certain tolerance for inaccuracies of data that inevitably arise with redundancy. DSS data is used as a basis for managerial decisions. As a consequence, the impact of data is not as severe in the derived, DSS environment as it is in the primitive, operational environment.
- *In the truth data base environment* primitive data is kept at a detailed level, but in the DSS environment, derived data is kept at a summary level. The accuracy of primitive data that forms the basis of derived data becomes unimportant as DSS data is summarized, averaged or considered from the perspective of many customers. Frankly, if two or three detailed records out of 10,000 records are inaccurate, the inaccuracy is irrelevant as the records are taken together as a whole.
- *In the truth data base environment* primitive truth data is accurate as of the moment the data is accessed (that is, it is accurate up to the second). Derived DSS data is only accurate as of the moment the data was extracted or otherwise derived. It is thus fundamental to the derived DSS environment that the timeliness of data must be factored into any processing. And

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when the same data base begins to have periodic extracts or derivations made, the derived data is necessarily redundant across time. It can be argued that DSS data should always be derived from a single operational source.

But many kinds of DSS processing — trend analysis, "what if" analysis, demographic analysis — absolutely require that an extract of primitive data be made once and only once. For those kinds of DSS processing (which, in fact, are at the heart of DSS processing) a dynamic, ever-changing base of primitive data simply cannot serve as a basis for the many iterations of DSS processing that are done. The DSS processing of necessity must operate against data that is frozen, and the extract process is ideal for creating frozen copies for DSS data.

For the above reasons, the issue of data redundancy that was so central to the truth data base environment is not nearly the same issue to the DSS environment. But wholesale redundancy of derived DSS data can lead to inconsistency of processing and results and, on a large enough scale, inconsistency of results in the DSS environment leads to an overall lack of credibility of the DSS environment.

### Achieving DSS credibility

It is understood there will be discrepancies of accuracy in processing in the DSS environment due to the inherent redundancy of derived DSS data and the autonomy of processing of the end-user environment. As long as the discrepancies are not major, the differences in final results are not a concern. But when the differences of opinion are gaping, the DSS environment risks losing all of its credibility unless the major differences can be reconciled. Thus the reconciliation of redundant DSS derived data is one of the cornerstones on which the credibility of DSS processing rests. There are three primary reasons why derived, redundant data becomes unreconcilable in the DSS environment.

**Reason 1**. Because of the difference in timing of the extract of data from the operational to the DSS environment. Is it reasonable to expect the DSS analysis of data done from an extraction made on Sunday night will yield compatible results with a DSS analysis done from an extraction made on Wednesday afternoon?

**Reason 2**. Because of the extract and derivation algorithms used to select which data flows from the operational to the DSS environment. Is it reasonable to expect the DSS analysis from an extract that selects data from all accounts with a balance of $500 or more will yield the same results as a DSS analysis that selects data for accounts that have more than 10 activities per month?

**Reason 3**. Because of the generations of extracts that are done. If the normal extract and derivation process merely used data directly from the operational environment, the problems would be minimized. But it is normal practice for extracted data to be further extracted, through more iterations, to the point where the origin of any DSS data is questionable.

An architecture that accounts for the above discrepancies will allow redundant DSS data to be reconciled when there is a discrepancy of major consequence.

The concept of the data base has been changed by the advent of fourth-generation language technology. This technology used to any extent at all mandates that data be redundant. In particular, data bases can be classified as primitive data base and derived data bases, each with its own appropriate practices. The early notions of a nonredundant subject orientation of data apply to primitive, operational-oriented data. Derived data is oriented toward DSS processing and is necessarily redundant. While DSS redundancy is a fact of life, when discrepancies between redundant stores of data are very large, there is the possibility the entire credibility of the DSS environment will be lost. To create an atmosphere of credibility in the DSS environment, huge discrepanices between redundant stores of data must be reconcilable. The reconcilability of DSS data is achieved by a disciplined approach to the building of DSS systems.

*Inmon is a senior principal at American Management Systems, Inc. and a noted author on the subject of data base design.*

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## PRODUCTS

# Wang, IBM Units Communicate Easier

LOWELL, Mass. — Wang Laboratories, Inc. has introduced three communications software products that simplify communications between Wang and IBM systems, the company said.

The Wang Office/Disoss Gateway has two upgrades (software Releases 1.5 and 2.0) that offer users the choice of IBM's LU 6.2 or Wang's Information Distribution Services (IDS) as VS-to-IBM mainframe transport options, support for IBM Distributed Office Support System (Disoss) library and distribution services, the ability to incorporate Disoss users into the Wang Office directory and support for both revisable and final-form documents.

Pricing for the Gateway depends on the transport being used. Common elements for both LU 6.2 and IDS are, for example, gateway software on the VS, priced at $4.000, and Document Content Architecture (DCA) to Wang word processing translators on the VS, priced at $2,000.

The Wang/Profs Gateway has a new release that adds functions such as exchanging messages between Wang Office and IBM Professional Office System (Profs), incorporating Profs users into a Wang Office directory and using a single VS as a gateway to other VS in a Wang Office network, eliminating the need for a dedicated communications line between each VS and the IBM mainframe, the vendor said.

The Wang/Profs Gateway consists of software on the VS ($2,000) and software on the IBM mainframe ($20,000).

The new Wang 3270 VS Logon allows IBM 3278 terminal users to access Wang VS applications such as Wang Office and Professional Application Creation Environment and resources such as disks and printers. Software for the 3270 VS Logon resides on the mainframe and costs $2,000.

For further information, contact Wang Laboratories, Inc., One Industrial Ave., Lowell, Mass. 01851.

Circle Reader Service Number 245

**Wang 3270 VS Logon on IBM 3278**

# IBM Network Wares Offered

RYE BROOK, N.Y. — IBM has introduced several network management software programs reportedly designed to allow central computer operators more flexibility in configuring and managing IBM networks.

Netview is a combination of three current IBM network management software programs: Network Communication Control Facility, Network Logical Data Manager and Network Problem Determination Application. Some functions from two other IBM programs, VTAM/Node Control Application and Network Management Productivity Facility, are also part of Netview. IBM said that with Netview the operator can detect hardware and software errors and problems with accessing a particular application. Netview's monthly license charge is $1,255 for MVS/XA systems, $1,060 for MVS/370 systems and $940 for VM systems.

Availability for MVS systems is fourth-quarter 1986 and first-quarter 1987 for VM systems. IBM's enhanced Version 3, Release 1.1 of the Advanced Communications Function/VTAM (ACF/VTAM), residing in the host, allows users of VM operating system to have the same Systems Network Architecture communications capability as MVS users. ACF/VTAM Version 3, Release 1.1 has a basic initial license charge of $6,255 under MVS/XA, $5,130 under MVS/370 and $3,535 under VM. Availability is July 1986 for MVS systems and September 1986 for VM systems.

Also introduced were enhancements to IBM's ACF/Network Control Program (ACF/NCP) Version 4, Release 2, allowing it to work with the new IBM 3270 and enhanced IBM 3725 communication controllers, IBM's new modems and the IBM Token-Ring Network adapter. Finally, the Multiple Applications From A Single Screen (MXXX), is part of VTAM host software and enables users of IBM 3270-type displays to switch between applications without having to log off. ACF/NCP Version 4, Release 2 has an initial license charge under MVS and VM of $2,085 and a basic monthly charge of $695. MXXX has a $8,000 one-time charge or basic monthly license charge of $365. For more information, contact IBM, Information Systems Group, 900 King St., Rye Brook, N.Y. 10573.

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# TASC Unveils Cobol Tool

READING, Mass. — A computer-assisted software tool involved with Cobol program maintenance was recently introduced by The Analytic Sciences Corp. (TASC). The product, called Fastbol, is part of TASC's Cobol Renewal Series and reportedly enables Cobol programmers to understand Cobol programs quickly, cutting down on an activity that accounts for a great deal of programming time and financial resources in many DP departments.

The product fits into any IBM MVS/TSO or VM/CMS environment, uses standard IBM systems software and works closely with program editors. Fastbol also enables users to make a menu selection by pointing to it or typing it into a command line.

Fastbol features a set of five commands.

Logic Flow helps trace the path of logic while How-Set and How-Used show variable relationships. How-Set shows the entire process that determines a variable's value, from input to final calculation. How-Used shows how a particular variable is used to affect the value of other variables through a hierarchy of variable relationships. The other two tools, Comments and History, provide better access to existing documentation and make it easier for programmers to leave better documentation for successive programmers. Comments provides access to notations left within the software program. History gives access to a Fastbol-maintained log of previous maintenance actions.

Fastbol is available immediately with a single-quantity price of $25,000. Volume discounts are available. Included in the cost are Fastbol software, user documentation and installation instructions. For more information, contact The Analytic Science Corp., One Jacob Way, Reading, Mass. 01867.

Circle Reader Service Number 247

# Mathcad Software Targets Engineers

**CAMBRIDGE, Mass. — Mathsoft, Inc. has announced Mathcad, a product that allows an engineer to use a personal computer like a scratch pad, where equations can be entered and calculated, plots can be created and text can be entered and edited, all on the same screen.**

**Mathsoft said Mathcad's word processor style allows users free-form entry, text-like editing of equations with familiar keystrokes and equations appearing on the screen just as they would appear in textbooks or on a blackboard. Its single-keystroke computations result in a single number or plot, and users can print all screen information as a document.**

**Mathcad runs on Microsoft Corp. MS-DOS 2.0 and higher and runs on the IBM Personal Computer, Personal Computer XT, AT and compatibles. The product needs at least 384K bytes of memory and a Hercules Computer Technology Co. monochrome, IBM color or IBM enhanced graphics card for color display. The company added that Mathcad support the Intel Corp. 8087 and 80287 coprocessors, the IBM graphics printer and the Hewlett-Packard Co. Laserjet printer. Mathcad is priced at $189.**

**For more information, contact Mathsoft, Inc., One Kendall Sq., Cambridge, Mass. 02139.**

Circle Reader Service Number 248

# Intech Line For Excelerator

**Intech's XL/Interface Series**

CAMBRIDGE, Mass. — Index Technology Corp. (Intech) has announced the XL/Interface series, a group of tools that allows Intech's microcomputer-based Excelerator design environment to work with other software.

The XL/Programmer Interface extracts data from the Excelerator dictionary for use in C programs and costs $395.

The XL/Interface-MFS reformats Excelerator screen designs for input to IBM's Message Format Service (MFS) mainframe screen production facility for the IMS data base management system and is priced at $195, according to the vendor.

The XL/Interface-GDDM formats Excelerator graph files for IBM's host-based Graphical Data Display Manager (GDDM) for output on any graphics device supported by GDDM — including laser printers, graphics terminals and graph printers — and is priced at $195.

Finally, the XL/Interface-Datamanager offers a two-way exchange with Manager Software Products, Inc.'s data dictionary for IBM hosts and is priced at $695.

For more information, contact Index Technology Corp., 101 Main St., Cambridge, Mass. 02142.

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CIRCLE READER SERVICE NUMBER 237

# DEC's Message Gateway

MAYNARD. Mass. — Digital Equipment Corp. has announced the Message Router X.400 Gateway V1.0. a layered VMS application that provides a communications path between a message-router-based network and any other message transport system that conforms to the 1984 CCITT X.400 recommendations for message handling systems.

DEC said the X.400 Gateway allows users of mail agents running on a message router (such as DEC's All-In-1) to send messages to other X 400 mail systems in other networks or within the same network. Hardware requirements include any valid VAX. Microvax II or Vaxstation II system configuration that supports the Decnet Phase IV network plus a communications interface that supports VAX PSI V4.0. Software requirements include VAX VMS or Micro VMS operating system V4.4: Decnet-VAX. PSI V4.0 VOTS V1.1 or any mail system running on a message router (requires VMS mail Gateway V2.1 for VMS mail connection).

Prices for the Message Router X.400 Gateway are as follows: $2.400 for the Microvax II: $6.240 for the VAX 8200 and 8300: $8.000 for the VAX 8500. 8600 and 8650: and $12.000 for the VAX 8800.

For further information. contact Digital Equipment Corp., Maynard. Mass. 01754.

Circle Reader Service Number 250

# PCs Get Statistical Software From SAS

CARY. N.C. — SAS Stat. a statistical software package for IBM Personal Computers and compatibles. has been introduced by SAS Institute. Inc. According to the company. SAS Stat performs both simple and complex analyses for regression analysis. analysis of variance. common factor and component analyses. discriminant analyses and scoring — applications. aimed at statisticians. researchers and analysts. The package can be used separately on a PC or in combination with host data.

SAS Stat runs on the IBM Personal Computer. Personal Computer XT. Personal Computer AT and compatibles. The first year license fee is $2.000 for corporate customers with up to 50 workstations.

Under the site licensing agreement. users receive software updates and technical support free of charge. For additional information. contact SAS Institute. Inc.. Box 8000. SAS Circle. Cary. N.C. 27511.

Circle Reader Service Number 251

# ADR Updates ADR/Ideal, Touts Better Processing Times

PRINCETON, N.J. — Applied Data Research, Inc. (ADR) recently announced a series of enhancements to its fourth-generation application development system, ADR/Ideal.

Release 1.3 reduces transaction storage requirements, decreases pseudoconversational storage requirements and reduces the usage of CPU resources, according to the vendor.

Additionally, enhancements to batch processing reduce processing time and also take advantage of ADR/Datacom/DB's sequential processing.

The company said that by using the table access strategies in ADR/Datacom/DB Release 7.4, I/O functions have dramatically been reduced during complex data base selection and in sequential batch processing.

The performance improvements in sequential batch processing include a 50% reduction in CPU time and in elapsed time.

ADR added that other enhancements in the release included wide-screen support, support for the distribution of production applications to multiple sites, enhanced data-view security and more direct and flexible management of interactive applications.

### Available for various environments

Release 1.3 of ADR/Ideal is available under CICS for DOS/VSE, OS/MVS and MVS/XA environments on IBM 370, 3081, 3083, 3084, 3090 Model 200, 4331, 4341, 4361 and 4381 mainframe computers and plug compatibles, the vendor said.

The permanent license price for ADR/Ideal is $97,000 for OS environments and $72,000 for DOS environments.

For further information, contact Applied Data Research, Inc., Route 206 and Orchard Road, CN-8, Princeton, N.J. 08540.

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- 9 ☐ Other User ______________________ (please specify)

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- 2 ☐ Financial Management
- 3 ☐ MIS/DP Management
- 4 ☐ MIS/DP Operations
- 5 ☐ Data Communications Management
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- 3 ☐ Information only

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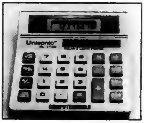

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**PRODUCTS**

# VAX-Based Software Out

ST. LOUIS — Poly-Share, a Digital Equipment Corp. VAX-based software product that enables users of personal computers and the VAX/VMS operating system to build libraries of personal computer applications, has been announced by Polygon Associates, Inc. The company said that Poly-Share users can check text or binary file entries into and out of the Poly-Share library, reducing repetitive data entry, using screen menus and fill-in-the-blanks formats.

To transfer files, Poly-Share prompts users to choose one or more entries, then the program automatically invokes Poly-XFR software on the VAX computer and Poly-COM software on a PC to transfer the entries to or from the user's PC. No separate file transfer commands are needed, and the user doesn't have to leave the Poly-Share program to handle delivery of library entries to or from the PC.

Poly-Share uses Polygon's Poly-XFR file transfer software on the host VAX system and either Poly-COM, Poly-COM/220 or Poly-COM/240 terminal emulation and file transfer products on the personal computer. Poly-Share pricing begins at $995. Contact Polygon Associates, Inc., 1024 Executive Pkwy., St. Louis, Mo. 63141.

Circle Reader Service Number 253

# On-Line's Stabilize/CICS Bows

FORT LEE, N.J. — On-Line Software International, Inc. has announced Stabilize/CICS, a product that helps maintain continuous system availability for a CICS operating environment, the company said. According to On-Line, Stabilize/CICS prevents CICS system outages by automatically repairing corrupted system code while the diagnostic component provides on-line diagnostic information.

The product offers three levels of protection. The first level activates Stabilize/CICS as a diagnostic tool only, logging errors into a file that can be accessed on-line. Under the second level, the product carries out error detection and restoration at the same capacity it would under full stabilization, but the company said it will not take any action that could affect data integrity. The third level provides full stabilization. If a transaction cannot be repaired, the product will remove the task entirely. The company claimed that Stabilize/CICS can cut CICS outages by 90%, repairing most abends in less than one second.

Stabilize/CICS costs $12,000 for a one-year license and $36,000 for a three-year license. The product is available for all MVS environments. For more information, contact On-Line Software International, Inc., Fort Lee Executive Park, 2 Executive Drive, Fort Lee, N.J. 07024.

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**BIM-FMAP—On-Line BMS Map Development**
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**BIMSWAP—CICS BTAM Terminal Switching**
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**BIMCMPRS—CICS 3270 Date Compression**
Reduces 3270 data transmission significantly, improves response time. **OS:** $2000 or $100/mo. **DOS:** $1600 or $80/mo.

**BIMTEXT—Document Composition, Word Processing**
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**BIMCNSOL—DOS/VSE Multiple/Remote Console**
Display-only or full input and display remote console facility at CICS terminal. $2000 or $100/mo full function, $1000 or $50/mo display only

**BIMMONTR—DOS/VSE System Status and Queue Display**
DOS/VSE system activity, performance measurement, and POWER queue and job display. $1200 or $60/mo

**BIMECHO—CRT Screen Duplication**
Copies 3270 CICS output at one CRT to another concurrently for problem determination, and demos. $1600 or $80/mo.

**BIMP3270—CICS/DOS CRT Screen Printing**
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# Honeywell Offers Office Modules

BILLERICA, Mass. — Honeywell, Inc. has announced a number of departmental software systems as part of its new Office Network Exchange Plus (ONE Plus) networking capability, which runs on Honeywell's new DPS 6 Plus family of 32-bit minicomputers.

The first group of software modules, which the company said will be available in September 1986, includes Onemail, an electronic mail system providing peer-to-peer communications ($1,350); Onetext, for document processing ($5,455); Onecalc, an electronic spreadsheet ($2,100); Onedial, a menu-driven facility allowing users to access public data networks, public data bases or other equipment using a TTY protocol for asynchronous communications ($2,500); and Onelist, a service enabling users to create, update and maintain single or multiple office-level data bases ($1,870).

**Honeywell's ONE Plus Runs On The Firm's DPS 6 Plus Line.**

Other systems to be available in December 1986 are Onexchange, a document library module of ONE Plus, allowing users of different systems to exchange information and create documents ($2,500); Onetext Plus, an enhancement to the Onetext document processing module; Onedocument, an option under Onetext that lets users integrate text with graphics ($1,010); Onebase, a departmental information base designed to let departments extract, format and make queries of data originating in other systems ($6,000).

ONE Plus Integrated Office System (Onexchange, Onemail, Onetime, Onetext) is $8,930; ONE Plus Office Exchange System (Onexchange, Onemail) is $3,275. All prices listed are for initial license fees. Contact Honeywell, Inc., 300 Concord Road, Billerica, Mass. 01821.

Circle Reader Service Number 255

# Borland Unwraps Data Base Business Package

SCOTTS VALLEY, Calif. — Reflex Workshop, a package containing data base models for specific types of business activities, has been introduced by Borland International.

According to the company, this product is used in conjunction with another Borland product called Reflex, The Analyst, to build and customize data bases in four areas: finance and accounting; administration; sales and marketing; and production and operations. Specific examples include purchase order entry and analysis, facilities planning, sales lead tracking and analysis and project scheduling. .

The company added that each application includes a summary of the application and its objectives, files needed from the Workshop diskette, appropriate Reflex features and functions, field names and global formulas, problem analysis and, if applicable, report generation.

To use Reflex Workshop users must first have a copy of Reflex, The Analyst Version 1.0 or later; an IBM Personal Computer, Personal Computer XT, Personal Computer AT or compatible with 384K bytes; a graphics board; two double-sided, double-density floppy disk drives or one floppy disk and one hard disk drive; and an IBM PC-DOS Version 2.0 or higher.

Reflex Workshop is priced either separately for $69.95 or bundled with Reflex, The Analyst for $149.95.

For more information about this product, contact Borland International, 4585 Scotts Valley Drive, Scotts Valley, Calif. 95066.

Circle Reader Service Number 256

# Sorcim Net Manager Out

SAN JOSE, Calif. — Easyplus Network Manager, a product that enables users to run windows on a network, has been introduced by Sorcim/IUS Micro Software.

The company said that its network manager uses network software and hardware to operate two or more microcomputers on a local-area network. Up to four users can share the same copy of the program and data base information that is said to be updated instantly and available for use by all workstations on the network simultaneously. Each workstation can also handle several tasks in separate screen windows. The company said the product was designed with file and record locking capabilities.

Each Easyplus Network Manager disk contains four network units allowing up to four workstations on a network. The number of windows each station can access and the number of workstations on the network can be increased by installing more network units. Up to 100 units can be installed on each network server.

The Easyplus Network Manager runs on IBM PC user stations with 256K bytes and requires a PC server station with a minimum of 512K bytes of hard-disk memory. Currently available for 3Com Corp.'s Etherseries, the product will soon be available for Novell, Inc.'s Netware, the vendor said. The network manager utility disk is $395 for four units, $595 for eight units. For more information, contact Sorcim/IUS Micro Software, 2195 Fortune Drive, San Jose, Calif. 95131.

Circle Reader Service Number 257

# Goal Systems Announces FAQS/VM

COLUMBUS, Ohio — Goal Systems International, Inc. has announced FAQS/VM for VM users who work with multiple guest operating systems. According to the company, FAQS/VM provides extended control for VM console and spool files at operations, systems and applications levels and is divided into two major components: Viewsp, which provides capabilities for VM spool files, and Viewcon, which aids in console file management.

Viewsp is divided into three parts: Vmenu, Vedit and Viewextr. Vmenu is menu-driven and provides spool file purging, transferring, ordering and printing, providing a menu of all VM spool files on the system. Vedit is a spool file editor that provides macro, synonym, extract and other capabilities. Viewextr simplifies communication in the Exeq or Rexx languages. The company said that an on-line Help facility is also provided for all of FAQS/VM's functions.

According to the firm, Viewcon provides enhanced console file management, including real-time scrolling and hard-copy file archiving to tape. FAQS/VM costs $4,760 for a permanent license or $119 a month for a three-year, renewable license. Contact Goal Systems International, Inc., Goal Systems Building, 5455 N. High St., Columbus, Ohio 43214

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July 14-16, Boston — **Expanding Uses of Dbase III.** Contact: The American Institute, 55 Main St., Madison, N.J. 07940.

July 14-16, Cambridge, Mass. — **Buying, Installing and Maintaining a Telecommunication System.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

July 14-17, Boston — **Software Trends for Executive Planning and Strategy.** Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

July 15-16, New York — **Intercompany Networks.** Contact: The Yankee Group, 89 Broad St., Boston, Mass. 02110.

July 16-18, San Francisco — **Telecommunications Management.** Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

July 21-22, San Diego — **The IBM PC XT/AT: Maximizing its Potential.** Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

July 21-22, Boston — **T1 Networking and Bypass.** Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

July 21-23, Hilton Head, S.C. — **The APICS Zero Inventory/Just-In-Time Seminar.** Contact: American Production and Inventory Control Society, Inc., 500 W. Annandale Road, Falls Church, Va. 22046.

July 22-23, Boston — **PC as a Programmer/Analyst Workstation.** Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

July 27-31, Anaheim, Calif. — **Information Center Conference.** Contact: Weingarten Publications, Inc., 38 Chauncy St., Boston, Mass. 02111.

July 28-30, San Francisco — **Computer Networks.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

July 29-30, San Francisco — **Financial Analysis for Telecommunications Equipment Aquisition.** Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521

August 17-20, Washington, D.C. — **The White House Conference on Small Business Exposition.** Contact: The White House Conference on Small Business Exposition, P.O. Box 17413, Washington, D.C. 20041.

August 18-20, Boston — **Data Networks: Management, Operation and Control.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

August 19-20, New York — **DEC: Next Five Years.** Contact: The Yankee Group, 89 Broad St., Boston, Mass. 02110.

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